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AUTOMOTIVE INDUSTRIES

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Cars That Stay Young

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Chrysler.....	{ De Soto Plymouth 65 & 75 Imperial	x	x	x	x	x
Cunningham.....	All	x	x	x	x	x
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Durant.....	{ 40, 60, 66 70	x	x	x	x	x
Eisner.....	{ 75 95, 96, 120	x	x	x	x	x
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Franklin.....	All	x	x	x	x	x
Gardner.....	All	x	x	x	x	x
Graham-Paige.....	{ 612 615 621, 827, 837	x	x	x	x	x
Hudson and Essex.....	All	x	x	x	x	x
Hupmobile.....	{ Century 6 Century 8	x	x	x	x	x
Jordan.....	All	x	x	x	x	x
Kissel.....	{ 75 & 95 126	x	x	x	x	x
Kleiber.....	All	x	x	x	x	x
Lafayette.....	All	x	x	x	x	x
Lincoln.....	All	x	x	x	x	x
Locomobile.....	86 & 88	x	x	x	x	x
Marmont.....	{ 68 78 Roosevelt	x	x	x	x	x
McFarlan.....	All	x	x	x	x	x
Moen.....	All	x	x	x	x	x
Nash.....	Sid 6	x	x	x	x	x
Nash.....	All	x	x	x	x	x
Peerless.....	All	x	x	x	x	x
Pierce-Arrow.....	All	x	x	x	x	x
Reo Flying Cloud.....	The Master Flying Cloud	x	x	x	x	x
Roamer.....	All	x	x	x	x	x
Stearns-Knight.....	{ 6-80 8-90	x	x	x	x	x
Studebaker and Erskine.....	All	x	x	x	x	x
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AUTOMOTIVE INDUSTRIES

AUTOMOBILE

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Established 1902

Vol. 60

No. 21

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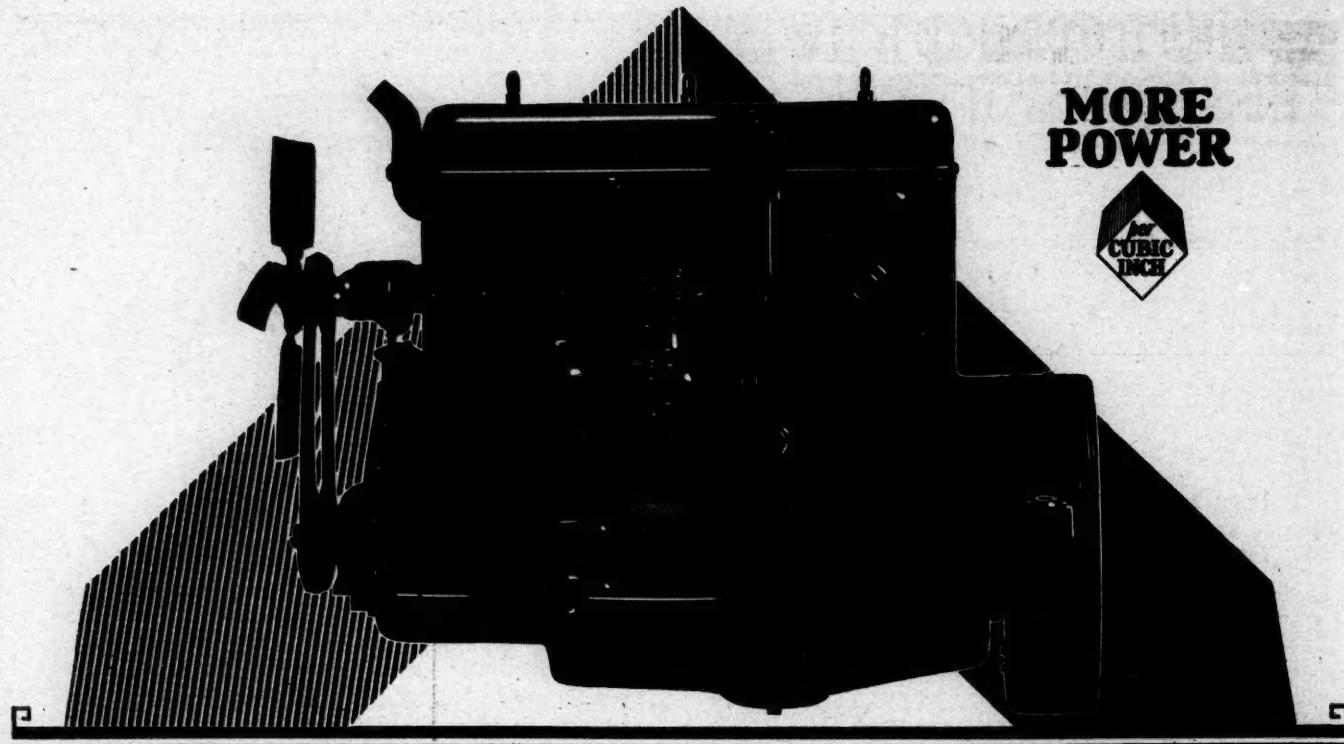
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AUTOMOTIVE INDUSTRIES

VOLUME 60

Philadelphia, Saturday, May 25, 1929

NUMBER 21

Greater Production Economies Foreseen by Plant Executives

New cutting metals, faster and more rigid machine tools, increase of automatic equipment and improved control methods are cited as foretokens of future progress.

By K. W. STILLMAN

ONE hears, now and then, the statement that future economies in the ultimate cost of goods must come from more efficient distribution—that production methods, particularly in the automotive industry, are almost perfect and cannot be greatly improved.

Fortunately, perhaps, this opinion either has not been brought to the attention of many automotive production executives or they have given it scant consideration. Of a number of factory men talked with during the past few weeks, practically all said that more thought was being given to ways and means of improving production methods, and with greater success, than has

been true, possibly, at any other period in automotive history.

While granting that their work has soared to heights of efficiency and economy rarely reached in distribution channels, these production executives seemed to be of a single mind that they had only begun to cut costs and that the coming years will be a period of very important developments in management and productive technique.

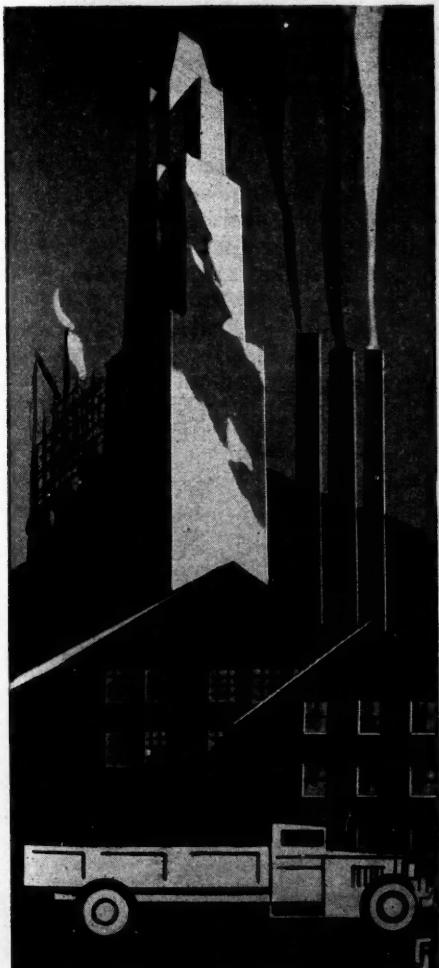
They cited the availability of new cutting materials, the development of faster and more rigid machine tools, the progress in the de-

sign of fully automatic machinery, the enormous strides being made in the elimination of labor for moving and handling materials, the better control which is now possible over men, machines and materials, and the increasing ability of men and managements to pull together, as all indicating that progress in the immediate future will be at least as rapid as it ever has been in the past.

One of the most important factors in the present situation, it was pointed out, and one which has vast possibilities for future far-reaching developments, is the recent introduction of tungsten-carbide alloys and similar materials for metal cutting tools. The remarkably high cutting speeds possible with this material and its metal removing performance makes it one of the most spectacular production developments of recent years.

Executives who passed through the period when the present high speed steels replaced carbon steels, and remember what that development did to machine tool design and machining methods, look for something of a similar nature when the uses and possibilities of the new materials are fully known. This they believe to be particularly probable since the tungsten-carbide alloys have performance characteristics above high speed tool steels which are apparently considerably greater than the improvement of the latter over the carbon steel tools they replaced to a large extent.

The general opinion in production circles is that much research remains to be done with tungsten-carbide tools before they can be employed with assurance, and some companies have had so little success with them that skepticism as to their worth has been raised. Enough satisfactory performance records have been made, however, to indicate rather conclusively that basically, the new materials offer immense advantages. Many of the present difficulties in the use of the material are blamed



on improper detail technique, such as the use of wrong machine tools, incorrect cutter design and particularly the use of tungsten-carbide under high speed steel conditions.

Aside from its possibilities in increasing the rate of metal removal, the development of tungsten-carbide alloys has been of unusual importance to production men as they try to anticipate its effect upon machine tool design. The general opinion seems to be that, while certain worth-while advantages can be obtained by the proper use of the new tool material on machine tools of present design, its fullest usefulness will not be available until there has been considerable redesigning of many machine tools to provide more power, greater rigidity at high speeds, better bearing equipment, more adequate lubrication and various other items of like nature.

In addition to redesigning for the purpose of adapting machine tools for use with tungsten-carbide alloys, a great deal of thought and no small amount of development work is being given to the further elimination of human effort in performing operations. Probably given an impetus by the development of the automatic frame plant of the A. O. Smith Corp., the idea is common throughout the industry that other component parts such as pistons, crankshafts, cylinder blocks, etc., should and can be produced in automatic machines in the operation of which manual attendance would be unnecessary.

While none of these ideas, apparently, has yet blossomed forth as a *fait accompli*, there are a number of developments under way which show great promise. The general idea underlying most of them seems to be the use of a number of individual, specialized machines, each performing one or more operations on the piece with the entire line tied together by automatic conveyors, locating and chucking devices and controlled as a unit.

The desirable feature of this type of equipment, as compared to a single machine to perform the entire

job, seems to be the decreased risk of obsolescence. In the automotive industry, there is a constant change in product design and this, added to the continual improvements being made in machine tool design, make obsolescence an ever present risk. With automatic equipment made up of a number of individual units, it is thought that this factor will be of less importance than it might be otherwise.

The increasing use of the super-speed cutting tools will be likely to accelerate the development of automatic equipment, according to some production men. They point out that under present conditions the limiting factor in the use of tungsten-carbide tools will be, in many cases, the ability of the machine operator to load and unload work. If all this can be done automatically, it might be possible to do it considerably faster than by hand and this would permit full advantage to be taken of the cutting abilities of the new tools.

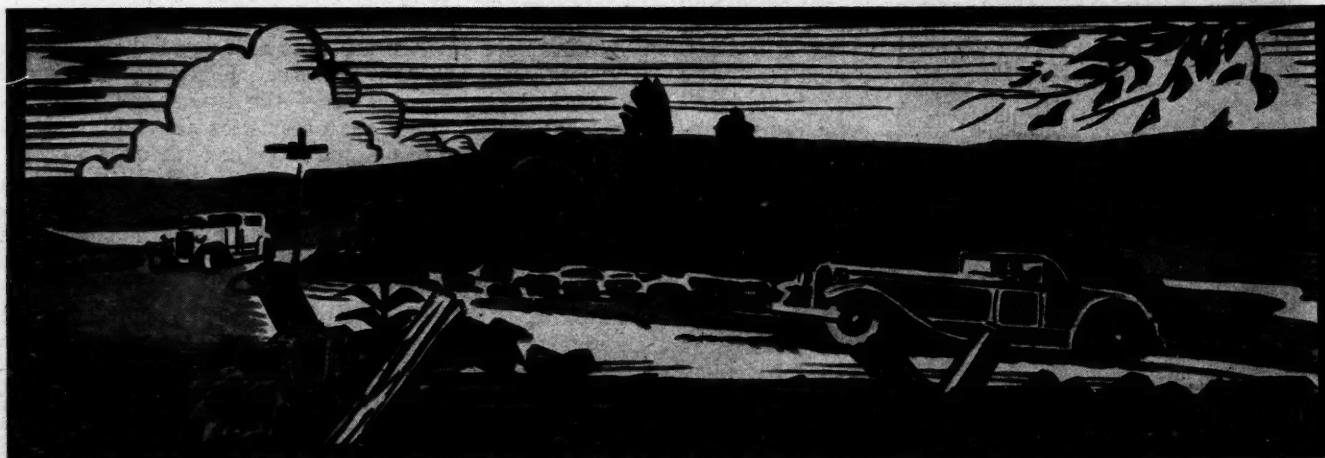
Aside from automatic machining units, the entire question of depreciation, obsolescence of machine tools and other shop equipment, appears to be getting more attention from production executives. They are realizing to a greater extent than ever before the importance of these factors in evaluating the profitable operation of their departments. A great deal of study is being given in many shops to accurate determination of depreciation rates which will replace in the surplus accounts the value of equipment well within its probable useful life.

While actual rates vary widely, depending upon the way in which the equipment is operated, the maintenance policy in force and other factors, the general tendency seems to be toward an upward revision in depreciation rates, so that values may

be written off in considerably less time than was the case a few years ago. This movement has met with some opposition from the Federal income tax authorities, but it is so necessary to good management that the present difficulties probably will be ironed out.



At the Studebaker plant, six-cylinder engine blocks pass through progressive machining operations over a heavy duty roller conveyor. This is an example of economical handling, combined with speed in a general operation where precision is essential



Day-Elder Trucks Redesigned For Better Performance

THE entire line of Day-Elder trucks, now known as the 1929 Day-Elder Super-Service

Sixes, has been redesigned from the standpoints of appearance, performance, and driver comfort.

Appearance has been enhanced by streamlining and remodeling the radiator, hood, cowl, fenders and running boards. Cabs are of the full-vision type with narrow posts and sloping one-piece windshields. Seat cushions, back rests and the adjustable steering gear have been designed to afford maximum comfort for the operator. The instrument panel on the dash is within easy reach of the driver.

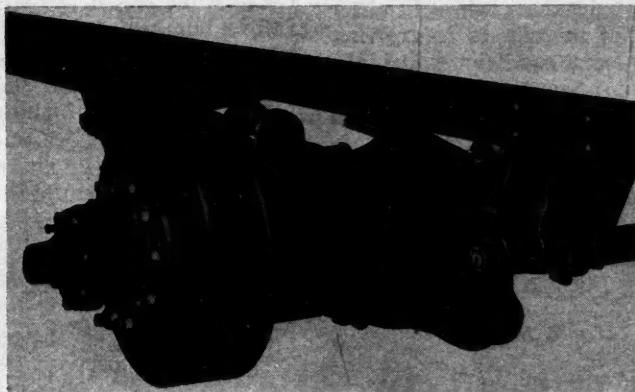
All models are equipped with six-cylinder engines and hydraulic internal four-wheel brakes, and, with the exception of the $1\frac{1}{4}$ and $1\frac{1}{2}$ -ton models, which have three-speed transmissions, all have four forward changes of gear. On the lighter models the final drive is by bevel gears, while worm-gear drive is used on the heavier ones, and both bevel-gear and worm-gear-driven axles are of the full-floating type. Although the 2 and 3-ton models are

All models are equipped with six-cylinder engine and hydraulic internal four-wheel brakes. Appearance enhanced.

regularly equipped with bevel gear rear axles, provision is made to furnish worm drive when required.

Engines are of the high-speed type and range from 65 hp. in the $1\frac{1}{4}$ -ton model to 105 hp. in the heavy-duty models. Crankshafts are carried in seven bearings and vibration is further reduced by spring mounting the engines in the chassis. The dump and heavy duty chassis are powered by the new Continental Series "R" engines.

The Model 30A bus chassis, which is used also for the high-speed, long distance transportation of merchandise, has an unusual rear spring assembly. The main spring is mounted above the axle housing, while an auxiliary spring is mounted below it. There are two main leaves in the upper spring, one of which is shackled to the auxiliary spring under tension. The light spring serves as a shock damper when the truck is traveling empty or partially loaded; the heavier spring comes into action under heavy loads. A vacuum type booster and gun iron brake drums are features of the braking system of this model.



View of rear spring assembly for bus chassis



Redesigned Day-Elder Truck

Aircraft Accessories Distribution Open to Automotive Wholesalers

*No definite steps taken as yet for organization of service
for engines, or replacement parts and equipment,
Motor and Equipment Association reports.*

By A. B. CROFOOT



DISTRIBUTION of aircraft engines, parts and most of the general supplies used in that industry is today becoming a specialized type of work, still more or less disorganized, but rapidly building up along definite lines, according to the survey recently completed by the Motor & Equipment Association.

In many cases this distribution is taking place through regular automotive wholesalers, while in other instances a new special class of merchants is growing up, depending largely upon local conditions and the aggressiveness of the various merchandising means available. In an extremely large portion of the field no definite step has been taken, as yet, toward organization of distributing mechanism, and the opportunities for the automotive wholesaler are wide open to this portion of the industry, according to the survey.

This survey covers the following topics:

- (a) Growth of the industry and developments in transportation.
- (b) Aviation progress in various sections of the country.
- (c) Distribution policies of aircraft, aircraft engines, parts and accessory manufacturers.
- (d) The automotive wholesaler in the aircraft industry. Sales possibilities, classes of competition, establishment of aircraft department, cultivation of the market, overhaul and replacement business per plane, and experiences of wholesalers developing airport business.
- (e) Summarizing suggestions.

The association's chief intent in the survey was to present an accurate, truthful picture of conditions. It has indicated the vast possibilities of the market, but, at the same time, has presented in detail the various sources of competition that the automotive jobber must contend with so that he would be better able to meet this competition and, in many cases, establish himself as a recognized and logical source of supply for aircraft products.

The survey indicates that a special class of distributors is growing up for two definite reasons: First, that aviation is a new field requiring special understanding, and second, that there are men available in the aircraft industry to whom aviation has been for years almost their sole interest and who naturally became the earliest traders in aircraft merchandise.

Automotive wholesalers are playing an important part in their communities in supplying aircraft service

stations in a large number of instances. Where they have failed to do this, it often has been due to their own lack of information as to the possibilities of this market.

The survey recommends earnest study of the market by all wholesalers, and calls attention to the fact that, whereas specialty distributors have sprung up at a number of airports, the vast majority of flying fields still offer an open door for automotive wholesalers who really want to get into the market. It points out carefully a number of ways and means by which automotive wholesalers can easily get into this industry and lists parts, accessories and shop equipment in daily demand for the servicing of airplanes. It also shows the average amount of service and overhaul required per plane.

Manufacturers of automotive parts, which fall in the class of original equipment for aircraft, obviously have been developing a market so far directly with the manufacturers of aircraft and engines. The time has come, however, when a growing market for replacements is springing up and the manufacturer of this equipment must seek the logical outlet whereby he can reach this replacement market.

For those interested in this market, the survey classifies the suppliers from whom aircraft operators and maintenance organizations are buying service parts, accessories and supplies as follows:

- 1—Direct from aircraft manufacturers.
- 2—Direct from engine manufacturers.
- 3—Special engine and engine parts distributors.
- 4—Special mail-order and supply houses, several of whom are selling nationally, while others are operating regionally.
- 5—Stores on the field, these being local or chain aircraft accessory stores which have sprung up at a number of airports and which carry the commoner parts and supplies, purchasing them from manufacturers or specialty distributors.
- 6—Automotive equipment wholesalers who are located conveniently near the airports, or who have solicited aircraft business—their largest business has been in the supplying of shop equipment.

The large transport companies usually purchase extensively for their own needs direct from manufacturers. In some instances they also undertake to supply replacement parts and equipment to other organizations operating in the airports at which they have their termini.

The special classes of distributors that have grown

up in the industry, as indicated in the above classification, are largely of three kinds. They are the mail-order houses which issue catalogs and cultivate contacts at the various air fields, the individual stores growing up right on the field and elsewhere, and the chain stores, some of which are resulting from these smaller individual stores expanding as their business warrants, and some of which are being established by the mail-order houses in order to maintain closer contact with the operators and service managers at the field.

Some of these chain stores and mail-order houses are operating, on certain lines, with wholesale discounts, but many automotive manufacturers selling products to the aviation industry have not yet recognized these houses as legitimate wholesalers and are giving them only secondary discounts. The mail-order houses particularly are now pretty generally receiving wholesale discounts and are becoming known as aircraft jobbers. The chain stores are not yet so widely recognized, although some of them are receiving wholesale discounts, particularly from manufacturers who specialize in aircraft engines and equipment.

The survey discloses in detail some of the policies adopted by engine manufacturers in their distribution of engines and replacement parts. The Wright company, for example, was the first engine manufacturer definitely to formulate a distribution policy. Their plan consists of appointing authorized distributors for Wright engines and parts, which was mentioned in an earlier survey. This plan is now well under way. The company has appointed, in a number of the busier flying centers, agents, giving them exclusive rights for the sale of the company's products in their territory and in turn authorizing them to appoint sub-dealers. The Wright plan calls first for the selection of a reputable

company or agent well versed in aircraft, who is thoroughly capable of selling their products and also of establishing and maintaining a completely equipped department to handle all repair, overhaul and replacement work on Wright engines. These distributors in turn may appoint sub-agents at different fields. Some of these sub-agents are equipped to do minor work, while in other cases they forward to the main distributor engines for major repairs.

Other companies have not yet so completely formulated their policies on distribution. Some of these have appointed automotive factory representatives as agents, while others have not reached a place where any policy has been formulated.

The plane manufacturers, in many cases, are building their own distributive organizations. Two of these are appealing directly to automotive dealers to handle their planes and supplies in their respective territories.

Over two-thirds of the Motor & Equipment Association manufacturer members are making aircraft parts or equipment for aircraft upkeep. This survey shows that the association is developing for them as much information as possible. Some of these manufacturers are selling, as has already been pointed out, direct to aircraft and engine manufacturers and to large transport operators for original equipment and replacements. Many of them are also selling to mail-order supply houses and are beginning to sell to the chain store organizations which are springing up.

Some of the special supply houses have been receiving orders for shop equipment as well as for replacement parts. Some of these orders are going direct from special supply houses to the manufacturer, while others are going through the local automotive wholesaler. The wholesaler is equipped to take care of this business, and

(Turn to page 802, please)



Oakland Heat-Treating Facilities Among Most Modern in Industry

Main installation provides for all operations on gears from hardening furnace to final straightening and burnishing, with minimum labor.

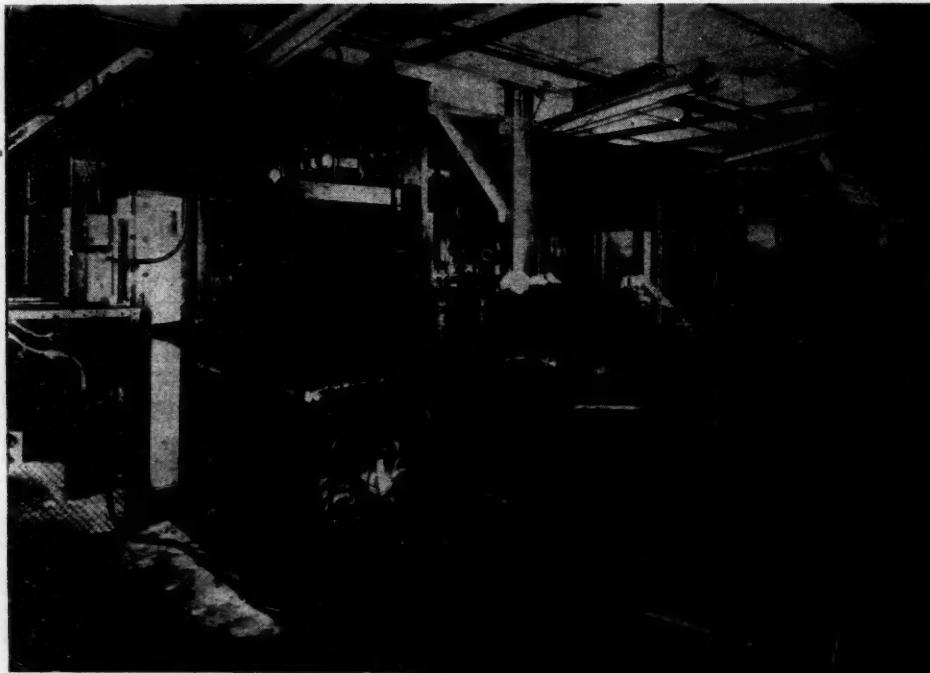
By ATHEL F. DENHAM

ONE of the most modern heat-treating installations in the motor car manufacturing industry is to be found in the recently revamped axle and transmission plant of the Oakland Motor Car Co. at Pontiac. With the completion of the new furnaces, heat-treating

of a number of parts which were formerly done by other concerns is now concentrated at the Oakland plant.

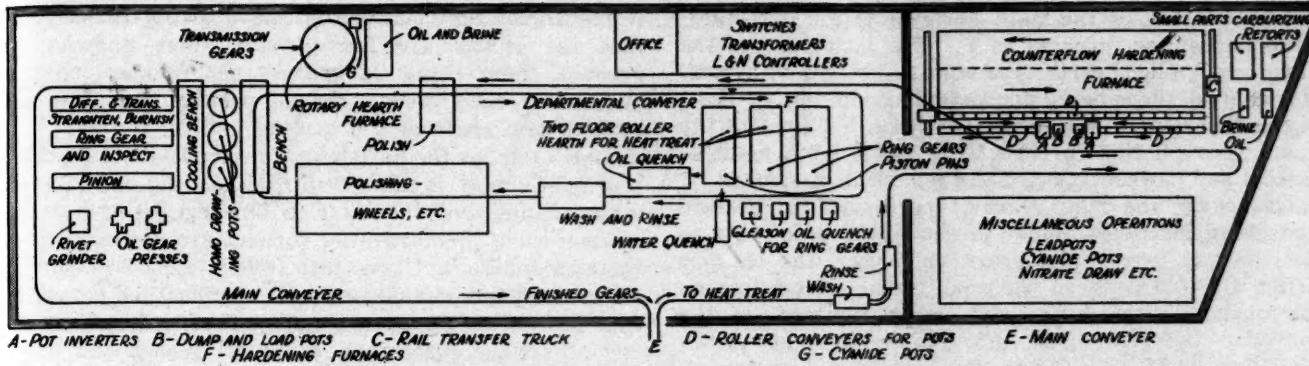
Of the heat-treating equipment installed, which is practically entirely of the electric furnace type, the rear axle shaft heat-treat and the facilities for handling heat-treating of all gears, pins and small parts are probably of greatest interest. In both of them manual labor for material handling and the skill factor required have been reduced to the minimum consistent with economical operation.

The main heat-treating installation, a floor plan of which is shown herewith,



One of the most interesting installations outside of the main heat-treat is the axle shaft heat-treat. Built into a single unit, this installation consists of a hardening furnace, oil quench and drawing furnace, with equalized time cycles. The above view shows the loading end of the drawing furnace. Note the longitudinal grooves and multiple pusher assembly

Another view of the rear of the axle shaft installation is seen below, showing how the axle shafts leave the hardening furnace via the quench tank without coming in contact with the outside air



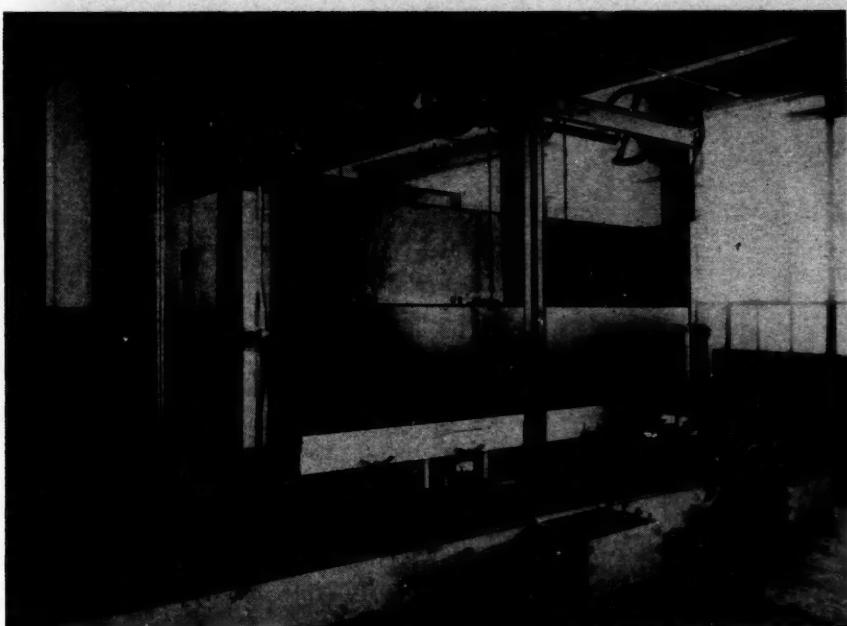
Floor plan of the main heat-treating installation at the Oakland Axle and Transmission plant. It is supplemented by various electric furnaces in other parts of the plant tailored into the production lines of the various units

comprises all operations on the gears from the hardening furnace, with preliminary wash and rinse, to the final straightening and burnishing. The larger parts are all brought in on the main conveyor E, on which they also leave. They first pass through an automatic washing and rinsing equipment. Ring gears are removed from the conveyor at B, where they are loaded into pots. The latter, after packing, are mechanically inverted at A, and by means of the roller conveyor D, and transfer truck C, are supplied to both ends of the counterflow furnace.

The counterflow has five different zones separated by baffles extending downward from the roof of the furnace, with the zones sealed to some extent by the pots on the roller hearth. The first stage is a pre-heat, where the outgoing pots radiate heat to the in-



Discharge end of the double-deck roller hearth hardening furnaces for rear axle ring gears, showing the Gleason quenching machines at the extreme left. At the left rear may be seen the oil quench for the hardened transmission gears, etc.



One of the most efficient units in the main heat-treat is this counterflow furnace. Note the transfer trucks for the pots and roller conveyor at right

coming pots, raising their temperature to about 1000 deg. F. The second stage is a soaking zone for the outgoing pots, and is used to raise the temperature of the incoming pots to 1650 deg. F. The third zone is the carburizing zone. The fourth zone is a reversal of the second, and the fifth of the first, etc. By means of this economizing of heat and elimination of much of the usual heat losses, it is stated that savings of upward of 15 lb. per kw., with a .040-.045 in. case, can be obtained.

Feed of the pots through this furnace is by means of Oil-Gear pushers. Pots leaving the oven are placed on the inner roller conveyor D, which serves both as a cooling bench and to bring the pots back to the dumping stations B. From here the ring gears

are transferred by the main conveyor to the two right-hand hardening furnaces at F. The latter are of the "two-floor" roller hearth type with two stages of pyrometer control, there being approximately 25 min. of heating and 20 min. of soaking at 1450 deg. F. Feed of the gears through this furnace is by means of a multiple ratchet and pawl rotation of the rollers themselves.

Quenching of the ring gears is performed in Gleason quenching machines, under pressure, the dies being so designed as to cool the gears uniformly, the oil flow being directed between the gear teeth. After leaving the quenching machines and being replaced on the conveyor, the gears pass through an automatic wash and rinse, and then go to the polishing department. From there they pass to the Homo draw furnaces, where they are drawn 60 min. at 240 deg. F. It will be noted that straightening presses, burnishers, and final inspection to which ring gears are then passed on, are all located in the same department, at the extreme left. The main conveyor then takes the gears back to the assembly line.

Other gears and pinions, differential pins, small parts, etc., are handled between operations in a similar manner according to requirements. Attention should be called to the floor space provision for future expansion.

The second interesting heat-treating installation is that for the rear axle shafts. This unit is located adjacent to the axle shaft line in another part of plant No. 5. Its chief feature is in the reduction of manual labor through automatic handling, the complete unit with two men handling 200 axle shafts per hour. The installation is roughly in a U-shape, the two legs being taken up by the hardening and drawing furnaces, while across the outlet of the hardening and the loading end of the drawing furnace there is located the oil quench.

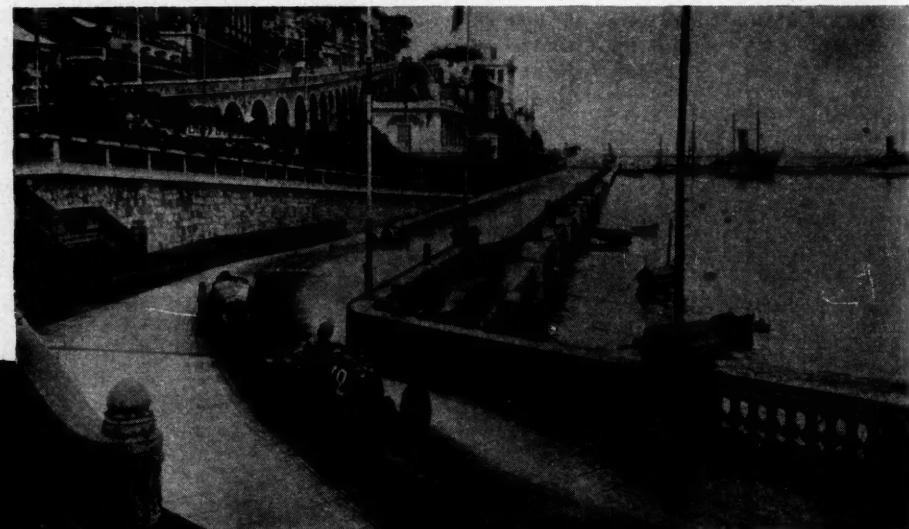
A feature of both hardening and drawing furnaces is that the shafts are fed through them endwise in grooves, there being 24 grooves per furnace, with a pusher for each groove, the 24 pushers operating off one eccentric shaft at the loading end.

Time cycle for the hardening furnace is about 56 min., of which 36 min. is taken up in the heating and 20 min. in the holding zone, the latter at 1525 deg. F. Axle shafts as they leave the hardening furnace are not exposed to the atmosphere, but slide into the oil quench through a sheet metal tunnel and drop onto a submerged conveyor, thus preventing an excessive amount of scale. The conveyor lifts the shafts out of the oil quench and drops them on a table adjacent to the loading end of the drawing furnace. The latter is practically a duplicate of the hardening unit and is designed to provide for approximately 52 min. of heating and 20 min. of holding at 940 deg. F., the time cycles for the two furnaces thus being identical. The entire time cycle for harden, quench and draw is 2½ hrs.

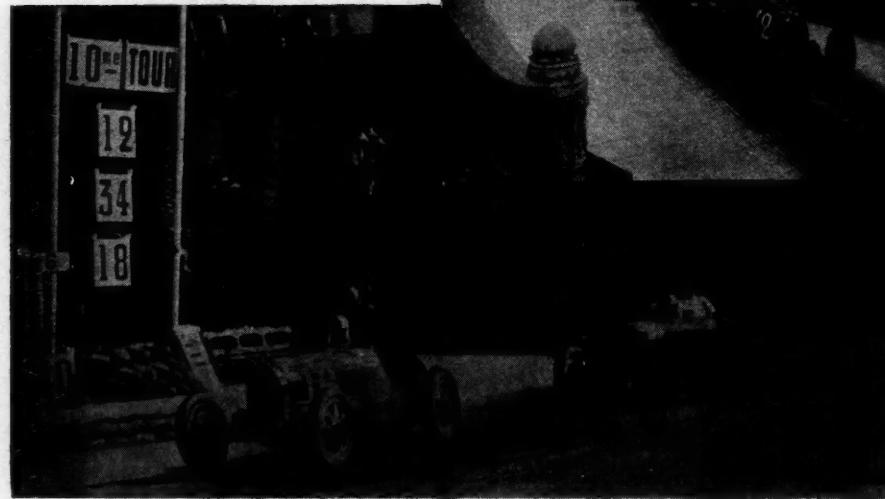
The feed for both furnaces, which of course are of the electric type, is electrically timed, the pusher eccentric being operated by an electric motor through reduction gearing. Heating is through T-grids at both top and bottom of the furnaces. Temperature control of the oil quench is maintained by a water intercooler with duplicate pyrometer control. The main control is at the intercooler, where a thermostatic valve is provided for the overflow. Oil from the intercooler enters the quench tank at the center of one end, flows the length of the tank, the circulation being assisted by the shaft ejecting conveyor, and then flows back along the outside of the tank back of two baffle walls, from where it overflows back into the intercooler.

Grand Prix at Monte Carlo

HEREWITH are views taken last month on the occasion of the First Monte Carlo Grand Prix, which was run through the main streets of Monte Carlo and was won by a supercharged Bugatti. The course was over a winding two-mile circuit. The winning car covered the 197-mile course in 3 hours 57 minutes and 11 seconds at an average speed of 49.8 m.p.h.



Above—Straightaway along the harbor front of Monte Carlo



Left—One of the difficult turns in the Grand Prix at the famous resort

Just Among Ourselves

Automobile and Aircraft Finally Consolidate Interests

THE close affiliation of automobile and airplane interests which has existed, psychologically as well as financially for many years, has been cemented with considerable finality by the active entrance of General Motors into this new field, as well as by the big corporation's definite interest in the recently formed Bendix Aviation organization. General Motors' advent in the aviation business comes rather as the fulfillment of a general expectation than as anything in the nature of a surprise. In these columns, for example, the statement appeared several weeks ago that "it is hard to believe that big organizations such as General Motors can remain out of this important field."

The move cannot help but have an important bearing, however, on speculation about the future development of aviation from a business standpoint. Instead of merely the close psychological kinship between the two forms of transportation, which at one time seemed to be the trend, there is some basis for the belief that actual operating control of a major part of future aviation activities finally may rest in the hands of men and organizations already grown powerful through success in the automobile field.

* * *

Present Export Facilities Available For Aircraft

THIS does not mean, of course, that the same wholesaling and retailing organizations will handle both airplanes and automobiles. Present trends, as a matter of fact, indicate that such combination merchandisers will be the exception rather than the rule, so far as the United States is concerned at least.

Export possibilities and policies in the aviation field still remain to be formulated in detail so far as most American interests are concerned. The large automobile companies, of course, have been increasing their foreign sales by leaps and bounds in recent years and in doing so have set up world-wide distributing organizations and facilities. It would seem logical to expect that these established foreign organizations, to some extent at least, might form the basis for future airplane exporting activities where the home company has an active interest in both industries.

* * *

The Automobile Supplants Ships of the Desert—

ANNUAL report of the American missionary hospital in Meshed, Persia, says the *Wall St. Journal*, states that the type of accident cases treated by the hospital has changed in the last few years. Patients resulting from automobile collisions are largely supplanting sufferers from camel bites and kicks. Broken arms from cranking cold motors is one form of accident mentioned prominently. . . . Every form of transportation, it would seem, has its hazards. It can be said for the automobile, at least, that its designers have eliminated a large proportion of the hazards inherent in it mechanically. Those which remain exist largely in the drivers rather than in the vehicle itself.

* * *

"Is the American-Built Light Car Possible Now?"

SPECULATION about the possibilities for design and financial success of an American-built light car was widespread three or four years ago. Then for a considerable period little

conversation was heard on this subject about the industry. J. D. Mooney and C. M. Foss started it going again with their discussion of such a vehicle in a paper read before the annual meeting of the S.A.E. in Detroit last January. Since that time both executives and engineers have been exhibiting considerable interest in the topic.

That such a car can be designed successfully is hardly to be doubted in the light of the engineering and research progress made by a number of units in the industry in recent years. The chief question still is, "Can it be marketed in sufficient quantities in the United States to make possible the low price essential, if it is to be successful both here and in the foreign field."

* * *

Price is High, and Pocketbook Thin

M.R. FOSS made an interesting reply to just that question at the meeting mentioned. "We put it another way," he said, "If a manufacturer in the United States wants to meet the needs he must make a light car. We have tried to point out the basic economic requirements. We have high overall costs of cars in the overseas market. We have, secondly, the lower purchasing power of the prospective buyer in overseas markets. The price is up and the pocketbook is thin. . . . I cannot say at this time how many cars one should build or how to build them to meet the economic requirements overseas. The problem presented is for the engineer to design and the manufacturer to build a car to meet the requirements as outlined." Will some American manufacturer meet the requirements outlined by Mr. Foss? Personally, we believe that such an automobile will be produced and sold successfully before very long. Five years ago we held an opposite view.—N.G.S.

Progressive Assembly of Airplanes Resembles Automotive Production

Control system used by Metal Aircraft Corp. illustrates possibilities of mass manufacturing methods for aeronautical industry.

STRICT aerodynamic design, as applied to commercial airplane production, has of late deferred to the development of more economical type from a production angle, making possible the installation of straight line production methods, and the improvement of production control systems. With the continued growth of the industry, this situation promises to become even more pronounced.

This is particularly true of companies making metal airplanes, which type lends itself most readily to quantity production on a basis comparable on a smaller scale to that of other types of automotive vehicles.

Perhaps one of the most interesting manufacturing systems, both from a production method, control and design angle is that of the Metal Aircraft Corp. of Cincinnati, producers of the "Flamingo." Its present type of ship, a seven-passenger cabin monoplane with

braced wings, is of all-metal design. The fuselage is of chrome molybdenum steel tubing with a corrugated alclad skin, the latter, however, not being designed to take any of the fuselage structural stresses. The wing has dural I-section beams with corrugated alclad skin, and dural ribs, the skin providing the drag bracing.

The type of corrugation is somewhat different from usual practice. The corrugations are spaced further apart than usual, between 3-in. centers. This not only makes for lower rolling cost, but is claimed to provide better low-speed controllability due to reduced drag resistance.

Only seven shapes and sizes of alclad or dural are bought by Metal Aircraft, the plane design being such as to reduce the total number of different types and sizes of parts required. Thus the wing is without taper in either direction and wing ribs are identical from

Fig. 1 (right)—Flamingo fuselages are assembled on exceptionally rugged I-beam metal jigs, for perfect alignment and ease of handling



Fig. 2 (left)—This view of the main plant gives an idea of the progressive assembly methods used. Stockrooms for raw materials are at the extreme rear. Sub-assemblies are located to the right of the final assembly lines



Fig. 3 (left)—As with all assembly work, wing spars are built up in metal jigs. The stiffeners shown on the beam in process are used also for attachment of the stamped duralumin ribs, the latter being in three separate sections, leading edge, center, and trailing edge



Fig. 4 (left)—Assembly of the complete wings is carried out in the jig shown here, which is so laid out that four groups of men can work on the wing at one time. In the view shown, the front spar has just been put in place prior to assembling the leading edge



Fig. 5 (right)—Assembly of tail surfaces is shown clearly in this view. The spar and ribs are of pressed dural, with alclad skin covering, as in the wings

fuselage to wing tip. The skin, which is bought ready-rolled, is .014 in. alclad.

All production operations, except for the fuselage assembly, are housed under one roof in a progressive production system. Fuselages, which are of chrome-molybdenum steel tubing, are welded in the usual manner on metal jigs. Incidentally, their design is based on a stress analysis for carbon steel tubing, providing an additional safety factor in case a piece of carbon steel tubing should, at some time or other, be welded into the structure in place of chrome molybdenum.

Starting with the stockroom at one end, the main assembly line extends the length of the plant, paralleled by the sub-assembly lines, the latter terminating at a point corresponding to the point of assembly into the ship on the main line. Jigs are used throughout in the sub-assemblies.

Fig. 3 shows the assembly of the main wing beam, which is primarily of I-section, the web being of thick section dural plate, and the flanges of angle shaped dural. Between the flanges, it will be noted, stiffeners are riveted. These not only supply added strength to the wing beam, but also serve as points of attachment for the ribs. Main straps for the attachment of the wing struts at 58 per cent of the span are of steel, riveted to both flanges and web. The main wing hinge attachment plate is also of steel and is riveted into the wing beam, into the web of which it extends a depth of about 14 in. Beyond the end of the plate, a wedge

shaped dural plate tapers the web thickness down to the normal size.

The main wing ribs, except at the ailerons, are all identical, due to the absence of wing taper. They can therefore be economically stamped out in dies. The ribs themselves are in three sections, the central portion, the leading edge rib and the trailing edge part.

Following assembly of the main spars, these two assemblies are then placed in the main wing jig, two wings to the jig, as shown in Fig. 4. The vertical position of the jig allows four sets of men to be working on each wing simultaneously, two on the front and two on the rear spar assemblies. All assembly work is by cold hammer riveting.

Fig. 5 gives an idea of the all-metal construction of the tail surfaces, the framework being shown in the front, and the covered elevator in the rear jig. Note that here also the stamped ribs are identical, while the main beam is a simple, U-shaped, dural stamping.

An interesting control system, based on the progressive assembly system used, has been worked out by Metal Aircraft. The control board, shown in Fig. 6, gives a good idea of the system followed. Production orders for airplanes are put through in groups, and a colored-head pin is assigned to each group. Each ship within a given group is then assigned a number and a paper tag bearing the number attached to the pin representing each sub-assembly. For instance, each ship will have one pin for the fuselage, two for the

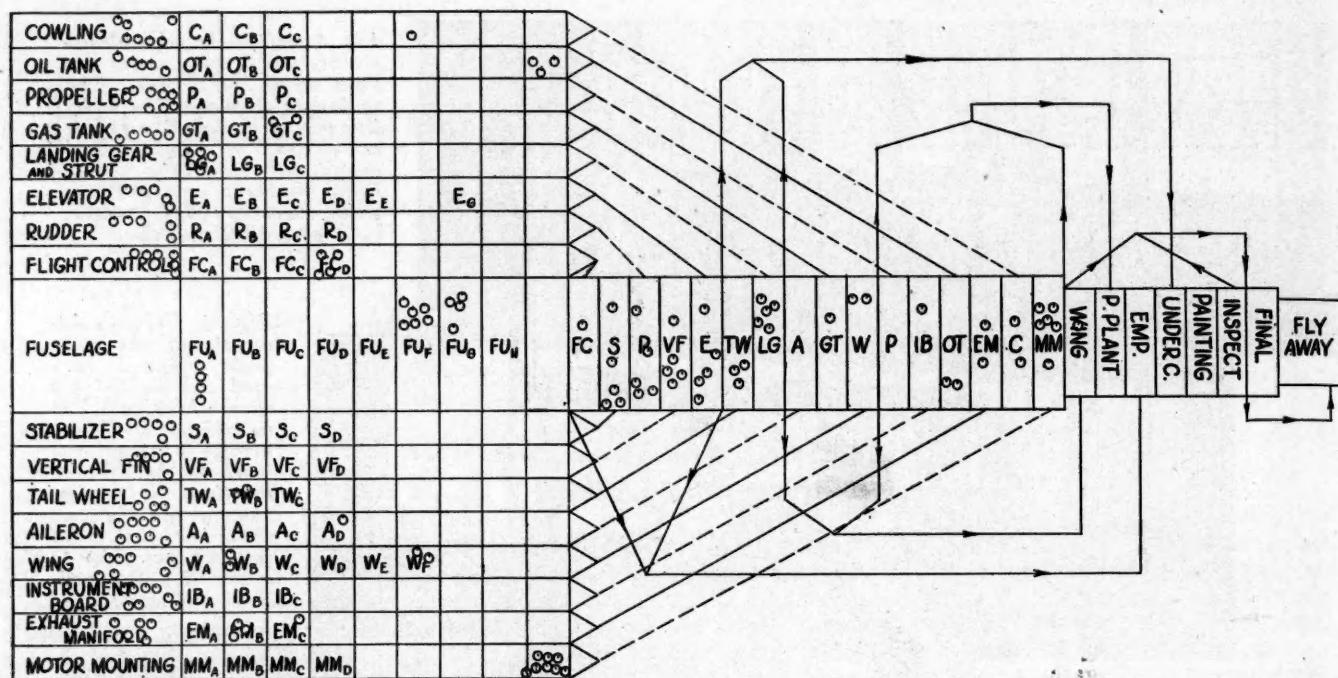


Fig. 6—Control chart of Metal Aircraft Corp., showing pins (small circles) indicating several stages of assembly as described in the accompanying article

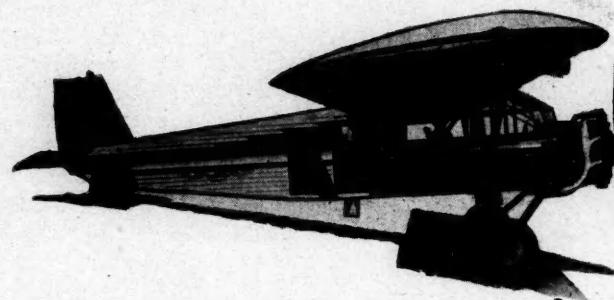
two wing halves, two for the elevators, and one for the stabilizer, two for the ailerons, etc.

Referring again to Fig. 6, the pins are first placed in the column at the extreme left as soon as materials are at hand for that sub-assembly. As the various stages of each sub-assembly are completed for a specific part, the pin is moved up into the corresponding square. After completion of the sub-assembly, the part either goes into stock or, if already called for, is assembled directly into the ship. The point at which assembly is

the specific part. If the fuselage and preceding assemblies have reached that point, the part is then assembled.

As soon as the latter assembly is complete, the pin representing that ship is moved down below the horizontal center line.

At a glance, the board indicates the state of completion of each ship in process, and enables immediate determination of the source of any tie-up. If the tail surfaces are lagging behind, steps are taken immediately to speed produc-



Completed Flamingo plane, ready for delivery

Aircraft Accessories Distribution Open to Automotive Wholesalers

(Continued from page 795)

through the information obtainable from this survey, he can get a definite idea as to the extent and possibilities of the shop equipment market in this field.

Accessory manufacturers also have a logical outlet in this field, particularly with the growth of the closed-cabin plane. Cabin planes today are luxuriously fitted, and the survey lists a number of items which the accessory manufacturers make and for which there is a marked need in the aircraft field.

Tying up with the survey of sales possibilities, the association recently issued a Buyers' Guide of Aircraft Products, listing approximately 350 parts, accessory and shop equipment items for aircraft and airports, made by members. This Guide, like the survey, has been sent to all member manufacturers and wholesalers, while the Buyers' Guide also has been given wide distribution among aircraft manufacturers, operators, flying schools and airports.

ing workmen. The ease of preparation of daily reports from this chart is obvious.

The survey concludes with the following suggestions to manufacturers:

1—Study the aircraft market as one largely alien to the automotive, having first in mind that quality is of extreme importance because failure of an aircraft part may mean death to plane occupants.

2—Consider the likelihood that the volume of business obtainable, though it may show but little profit now, may grow with unexpected rapidity. Let the industry know that you are making aircraft merchandise.

3—Watch the almost continuous news of new incorporations, mergers, etc., opening new sales possibilities.

4—Work closely, whenever possible, with aircraft manufacturers.

- 5—Participate in authorized aircraft shows.
- 6—Assist wholesalers whenever possible in obtaining

Vibration Handicaps Diamond Tools, A. S. M. E. is Told at Rochester

Elimination of that factor will enable such equipment to stand any temperature as long as it is cutting freely, conference is informed.

THE four-day meeting of the American Society of Mechanical Engineers, held in Rochester, N. Y., last week, brought forth discussion of several topics of particular interest to automotive men. Among them were a report on diamonds as metal-cutting tools, a report of an investigation of tungsten carbide cutting alloys, a discussion of economies which may be obtained in power transmission and several papers on the general subjects of production, sales control and budgeting.

In a paper discussing the synchronization of sales and production, Howard M. Hubbard pointed out that the economic movement of recent years has brought about severe competitive conditions under which goods must be produced at the minimum cost. Likewise, distribution departments must be prepared to render prompt and effective service to customers and must be ready to meet all reasonable demands in regard to style, etc.

In order to do each of these things, Mr. Hubbard said, preplanning of activities is the prime essential, and the extent to which they are done well depends very largely upon the study made of markets and business conditions preliminary to forecasting. In short, according to Mr. Hubbard, management must determine where business is going, how it is going to get there and then must establish some sort of effective inspection system to see that the desired goal is reached.

He agreed with Donaldson Brown when the latter said "A theoretically perfect coordination of business comprehends an exact knowledge in advance of what the public wants (within the limits, of course, of human ability to supply); an exact knowledge of how much the public wants (within the limits of human ability to buy and consume); and a regulation of production in accordance to fit those ultimate consumer demands for both kind and quality of goods."

In discussing diamonds as metal-cutting tools, C. L. Bausch, manager, Research and Engineering, Bausch & Lomb, said that they were particularly suitable where the material to be machined is too hard for a steel

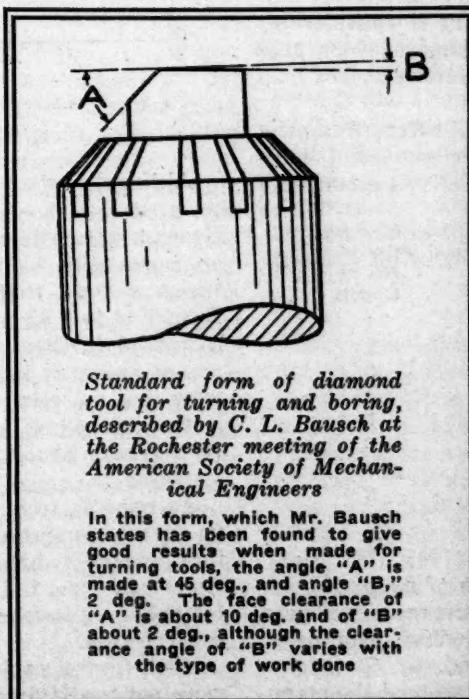
tool, or where greater accuracy or better finish is wanted than can be obtained with steel tools. To obtain good results the bore must be selected very carefully and then positioned in its holder so that the cleavage plane will be parallel to the top surface of the tool.

The main limiting factor in the use of diamond tools, according to Mr. Bausch, is vibration. The diamond will stand any temperature as long as it is cutting freely and there is no vibration. Big generous bearings or rugged ball-bearing construction are needed to give good results, and Mr. Bausch recommended that when very accurate work is to be done the machine should first be run into normal operating temperature before fine work was begun.

As an idea of the type of work possible with diamond tools, Mr. Bausch said that cast bronze periscope heads 12 in. in diameter and 30 in. long have been finished to withing 0.0002 in. over their entire length. Surface speeds of 1000 ft. per min. are possible with feeds from 0.001 in. to 0.003 in. per rev., and with depth of cuts ranging from 0.015 in. to 0.025 in. for roughing cuts and from 0.004 in. to 0.010 in. for finishing cuts. Turning and boring accuracy to 0.0001 in. is obtainable with beautiful mirror-like finishes being obtained.

In a paper on economies which may be obtained in power transmission, W. W. Nichols, of D. P. Brown & Co., pointed out that in the proper selection of belting, the motorization of machine tools, the use of group drive and more extended use of flywheels all offer possibilities in reduction of costs. A great deal of the material of this paper was presented in *Automotive Industries* of Aug. 11 and 18, 1928.

Methods for controlling the manufacture of parts on order and for stock by means of the Gantt progress chart were presented by David B. Porter. This type of chart functions to bring in advance to the attention of the executive those things which require action and thereby to eliminate the necessity of following up delays. The charts measure the progress made in the manufacturing program and, in so doing, also serve as a measure of executive ability.



German Automobile Output Gained Last Year as Imports Grew

Merging movement failed to produce powerful unit; plan for great trust was dropped because of inability to fix any definite objective reasons.

In an extensive business report made to the German Automobile Dealers Association at its annual meeting on April 16, there appears an interesting review of developments in the German and foreign automobile industries during the year 1928. The author of the report is Johannes Buschmann, general manager of the association.

The heavy gain in output which began in the German automobile industry in 1927 continued during 1928. In the report showing the production of vehicles of different classes during each of the last three years a table is given which shows the following increases from 1927 to 1928: Value of total production, 21 per cent; number of vehicles and motorcycles produced, 39 per cent; motor vehicles, 20 per cent; motorcycles 65 per cent; passenger automobiles, 18 per cent; motor trucks, 23 per cent; buses, 31 per cent; special vehicles, 26 per cent; large motorcycles (above a certain piston displacement, which are subjected to an annual tax) 17 per cent; small motorcycles, 370 per cent.

As to the number of works which shared in this production, a reliable guide is found in the membership of the German Automobile Manufacturers Association. In 1928 it included 27 works producing passenger cars, 22 producing commercial vehicles, and 18 producing motorcycles. These figures, however, are not quite complete. In the automobile industry there are a few outsiders, and in the motorcycle industry a considerably larger number (70 to 80), but in almost every case these are small concerns whose productions do not bulk large in the whole.

The plants referred to produced 95 different models of passenger cars and 91 models of commercial vehicles. These numbers are divided as follows among the different works:

Passenger Cars		Commercial Vehicles	
No. of Plants	No. of Models	No. of Plants	No. of Models
8	1	4	1
6	2	3	2
5	3	1	3
2	4	5	4
2	5	2	5
2	8	3	6
1	9	3	7
1	17	1	9
<hr/>		<hr/>	
Totals	27	95	22
			91

Fig. 1 herewith shows the variation of passenger car production and sales during the year, the cross-sectioned area representing an excess of production over sales, which went to increase stocks on hand.

Duerkopp, Faun and Komnick discontinued the manu-

facture of passenger cars in the course of the year and now confine themselves to the production of commercial vehicles. The number of models produced by the different firms, however, is alarmingly high. That is the more remarkable since the need for restraint in this direction has often been expressed by men in the industry. For instance, at the time of the last automobile show, it was stated by the business manager of the Automobile Manufacturers Association, Dr. Scholz, that the object of the proposed research institute was to carry out the work necessary to reducing the number of models, which in turn was to lead to production on a larger scale and the cutting down of production costs.

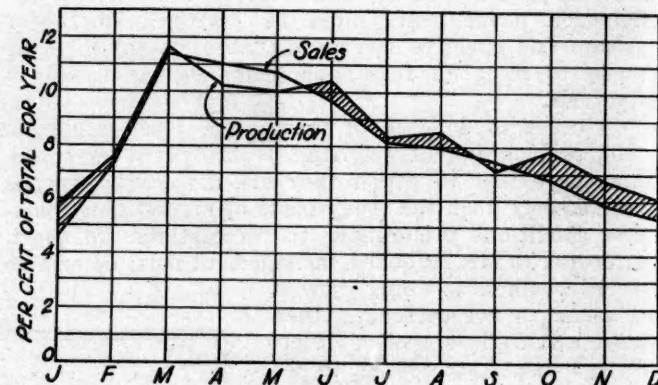


Fig. 1—Curves of car production and sales by dealers in Germany

Although this problem remains, nevertheless, great progress has been made in the rationalization of the German automobile industry; that is, its reorganization on a scientific basis. In 1927, figures were published which showed that since 1925 production had grown from 1.46 to 2.82 cars per man per year, and production increased further in 1928. Average wages in the automobile industry increased from 2060 to 2390 marks per year, but in view of the greater production this still leaves a decrease in the outlay for wages of 40 per cent [the report has it as 60 per cent, which is evidently an error].

As regards technical developments, there is apparent an increasing internationalization and a general leveling, which is bringing European cars closer to the American type, but there has been also a certain adaptation of American design to European principles of construction.

With few exceptions, the financial returns of the year were not gratifying to the German automobile industry.

There is no doubt that it still is facing a serious crisis, the same as last year. This is plainly reflected by the index of automobile stock quotations, which is dropping constantly farther below the index for the 20 most important industries. Fig. 2 shows the trend of German industrial stocks during 1928, the light line representing the index for 20 important industries and the heavy line the index of automobile stocks.

The collapse of the Schapiro combine (N.S.U. and Dixi) and the consequences thereof, the difficulties which arose in the N.A.G. when Presto was taken over, and the necessity of a drastic financial reorganization of Adler may be mentioned here as illustrations of the critical situation. Dixi, which was formerly owned by the Gotha Car Works, is now controlled by the Bavarian Motor Works. Opel, which was transformed into a limited liability company, took over the Elite-Diamant Works. Aside from those instances, the merging movement in the German industry did not produce any large, powerful combinations during the year under review.

Trust Plan Failed

The plan for a great German automobile trust, which was much discussed at one time and has consideration in the conference rooms of the banks, failed for not altogether objective reasons. What will be the attitude of the trade toward the plan if it should bob up again will depend on the attitude it assumes toward the trade. "If it should attempt to further develop the plan of sales through factory branches, which already has reached larger proportions in Germany than in other countries, then the trade would defend itself against such attempts, and not only in its own interests but in the interests of the automobile buyers," said the report.

The check which the merger movement has received in the German automobile industry is characterized by the dissolution of the Community of German Automobile Works, which occurred toward the end of the year. The reason for the dissolution of this sales combination was that the division of production, which was aimed at when the combination was formed, could no longer be maintained. All three of the works concerned tended toward the production of cars that were in direct competition with each other, instead of complementing one another in the manufacturing program.

Invasion of Foreign Interests

The most notable event in the development of the German automobile market during 1928 was the invasion of the foreign industries. The negotiations looking to a participation of the Belgian Minerva firm in Daimler-Benz did not lead to any results. But the financial reorganization of the N.S.U. gave the Italian Fiat firm the opportunity to secure control over this German firm. Fiat acquired about 90 per cent of the reduced capital stock of the firm and put its officials in charge, and in addition it bought the Heilbronn Works, which had been detached from the main works, in order to secure for itself an assembling plant, and possibly a manufacturing plant for a later period. Of even greater importance, if not decisive with respect to the fate of the German industry, is the acquisition of the majority holdings in the Opel Works by the General Motors Corp., which deal was initiated in 1928 and has been carried through in the meantime. It amounts to the passing into American hands of the largest and most successful of German automobile plants.

Foreign firms did not erect any new assembling or manufacturing plants in Germany in the course of last year. Durant acquired an industrial tract in Spandau, but has not started building, and the plan of Graham-

Paige, to assemble in Adlershof near Berlin, has not been carried into effect.

In France, five automobile works (Aries, Delahaye, Donnet, Rosengart and Chenard & Walcker) formed a combination for the purpose of jointly purchasing their raw materials and parts. It is not intended to do any-

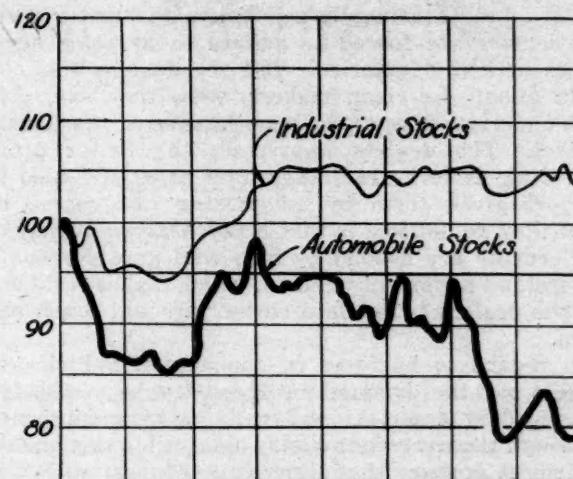


Fig. 2—German industrial and automobile stocks during 1928

thing more. Reports regarding the buying into French automobile firms by Americans have not been verified. On the other hand, there have been meetings, with the object of an eventual merger, between the Belgian Imperia and the French Voisin firms. In Belgium, there was a fusion of the Excelsior, Metallurgique, Matthys Freres and Imperia firms, and Minerva and F.N. also combined their interests.

In Austria, the Austro-Daimler Works were merged with the Puch Works.

All European manufacturing countries suffered a notable decline in their exports, owing to American competition, which is constantly gaining in strength in the world's markets. Only Germany enjoyed a slight gain in foreign markets, although the absolute value of its automobile exports is still quite small. In the home market, the American manufacturers gained ground from German manufacturers almost everywhere.

These conditions led to a get-together of English, French and Italian automobile manufacturers, in which later some representatives of the German industry took part. The plan of a general European automobile combine was considered, which was to counterbalance the American predominance. In view of the conflicting interests within the European industry itself, these negotiations failed to produce practical results.

Most Popular Cars

An interesting feature of the report is an investigation as to the popularity of various sizes of cars in Germany. It is generally assumed that small cars up to 122 cu. in. are largely in the majority. As a matter of fact, there are registered in Germany some 197,000 of these cars, against 144,000 of the larger class, and it is remarkable that over 103,000 of these latter are of the 186 cu. in. class, a typical American size. Indeed this development is largely ascribed to American imports and the growing desire of German buyers for more powerful machines with a greater margin of power. As to body types preferred, it is noted that 75 to 90 per cent of all sales are in closed cars. Cabriolets are finding increasing favor.

The small margin of profit left the dealers by the German industry has already been mentioned. The dealers, however, complain also about the rigorous conditions imposed by the makers and above all, about the price cutting indulged in by factory branches. Many German makers maintain their own sales offices in the larger cities, which compete with the regular dealers and occasionally sell below the prices which the dealers are forced to adhere to by their agreements with the factories. But the dealers also complain about American makers, who, they say, often lack understanding of the peculiarities of the German market. The dealers appreciate the better profits American makers grant them and especially also the support given them by advertising campaigns, but what they do not like is that many American concerns in Germany are headed by men who hardly speak or understand a word of German, which makes it difficult for the dealers to get into closer personal touch with them.

In regard to business in commercial vehicles the dealers say the demand for speed trucks of the type developed by American makers is growing constantly. Although the German industry also builds this class of vehicle, it appears that American competition is very keen. In the heavier classes of vehicles, on the other hand, the German industry is well able to hold its own. Business in motorcycles has been good, though not quite as good as in 1927. The new taxation, which exempts all motorcycles up to 200 cc. (12 cu. cm.) piston displacement from taxes and their operators from the duty of procuring drivers' licenses, has

brought a boom in this field. It is pointed out that motorcycles in Germany are now being used mainly for business purposes and touring, and less for pure sport.

A chapter in the report is devoted to the used car problem. In practically 50 per cent of all cases dealers are now forced to take in old vehicles (or motorcycles) in part payment. This has confronted the dealers with new problems, as German buyers, no less than others, generally greatly overestimate the value of their old machines. A way out of the difficulty seems to have been found in the establishment of "Valuation and Trustee Companies" in various centers. These companies have been founded by the dealers' association together with the German Automobile Manufacturers Association with the object of examining and appraising old vehicles, and issuing certificates stating a fair value.

In regard to time sales the dealers say that 68 per cent of all sales are now being effected on this basis. They complain that the German laws do not sufficiently protect them against losses, and hold up the American and Italian laws as models worthy of imitation. The dealers have long urgently petitioned for the establishment of an obligatory automobile register on the American and Italian lines, in which the ownership reservations are entered, but the German government has consistently declined taking any such steps. Now such a register has been started privately by the "Deutsche Treuhand A. G. fur War-enverkehr" in Berlin in collaboration with the automobile sales financing banks.

Kent-Owens Automatic Polisher and Buffer

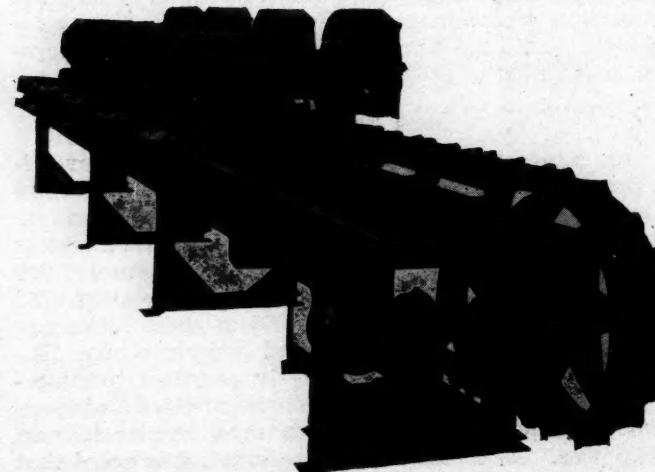
A NEW automatic, continuous type, grinding, buffing and polishing machine especially adapted for such parts as bumper rails, running board strips, hardware, small tools, etc., is introduced by Kent-Owens Machine Company. As may be noted from the illustration, the machine can be provided with any number of heads, each of which is individual motor driven through flexible V-belts. Spindles, themselves, are mounted in ball bearings and speeds are variable, due to the belt drive, so that each wheel can be operated at the speed giving maximum efficiency for its specific condition. Hand levers located on the front of the machine are provided to vary the wheel pressure within the range up to 200 lb. and over. Angular wheel adjustment permits setting of wheels

at angles up to 10 deg. to the right or left of line of work traveled. Successive wheels can be staggered to reduce wheel marks and improve the finish.

Work feed is by means of a steel-faced felt riding on roller bearing supports, the steel facing being provided to eliminate belt stretch, and providing large flat areas for the mounting of a wide variety of work.

Following are major specifications:

Width of conveyor belt	7 in. or 10 in.
Speed of conveyor belt	17 ft. to 45 ft. per min.
Diameter of wheels	16 in. maximum
Spindle speed	2100 or 2600 R.P.M.
Spindle motor recommended	10 hp. at 1800 R.P.M.
Conveyor motor recommended	{ enclosed, self-ventilating 2 hp. at 1200 R.P.M.
Center distance between spindles	38 in.
Working height	35 in.
Overall length	Standard—for work up to 12 in. long
4-wheel machine	17 ft. 5 in.
6-wheel machine	23 ft. 9 in.
10-wheel machine	36 ft. 5 in.



Kent-Owens continuous-type grinding, buffing and polishing machine

Discuss International Views

ALTHOUGH the National Industrial Conference Board was organized to provide an economic laboratory for the analysis of national economic problems, conditions have changed to such an extent that its thirteenth annual meeting held in New York last week was almost entirely devoted to a discussion of international conditions and relationships and their effect upon American business.

Magnus W. Alexander, president of the Board, said that while individualism has its place in the scheme of things, mankind cannot escape the conclusion that it is one body and that its tribulations, wars and miseries are usually identified with over-accentuated individualism, or too long maintained isolation.

Gear Stress Distribution Traced in Moving Picture

Load cycles in teeth shown by photo-elastic method at annual meeting of the American Gear Manufacturers Association in Cleveland

By P. M. HELDT

SEVERAL excellent papers were presented at the thirteenth annual meeting of the American Gear Manufacturers Association held at the Statler Hotel, Cleveland, May 16-18. The particular "high spot" of the technical sessions was a display of motion pictures showing the distribution and variation of stresses in the teeth of gears under load and in motion. The films were produced in the research laboratory of the Westinghouse Electric & Mfg. Co. at East Pittsburgh and were displayed in connection with the presentation of a paper on "Load and Stress Cycles in Gear Teeth" by R. V. Baud and R. E. Peterson, of the Westinghouse research staff.

A. H. Candee of the Gleason Works presented two papers, both of which were very favorably commented on. One of these dealt with "Gear Geometry." In it the author started with the fundamental conceptions employed in the calculation of gears, such as center distance, pitch, etc., and built up a logical system which includes a number of concepts that few, except designers of cutting tools, ever have to deal with. He showed, for instance, that no less than seven different pitches have to be figured with in gear work, and that, if we pass from the plane geometry of a section of the gear in the plane of rotation, to the space geometry of a real gear, we have to deal with eight different planes. The other paper presented by Mr. Candee was originally presented at the Rochester meeting of the American Society of Mechanical Engineers a few days earlier, and was placed on the program of the A.G.M.A. meeting to take the place of a paper on "Carboloy and its Place in the Industrial Arts," by E. G. Gilson of the General Electric Co., who found it impossible to be present.

Numerous subcommittees of the Standardization Committee presented reports, but most of these were progress reports and definite action was taken on but a few matters. The National Foundry Company of Erie, Pa., was elected to membership.

Division of Tooth Load

Baud and Peterson, in their paper on "Load and Stress Cycles in Gear Teeth," described research work in which they had attacked this problem along two different lines. They first developed a method for computing the division of the tooth load between two pairs of teeth which are in contact simultaneously. Designers often assume that when the load is taken by two pairs of teeth, it is divided equally between them, but this is not the case. The division depends upon the deflection of the teeth, which increases with the distance of

the point of contact from the root of the tooth. A formula was developed giving the variation of the load on each tooth as a function of the distance along the line of action to the momentary point of contact, and this method was illustrated by applying it to three sets of 10-diametral pitch gears of 20, 35 and 75 teeth in both gears of a pair (1:1 ratio). The numbers of teeth in simultaneous contact with the three sets were 1.68, 2.08 and 2.32.

The second part of the paper related to the second method of attack, by means of the photo-elastic method, which was employed because the analytical method does not make it possible to determine stress distribution. To illustrate this part of the paper use was made of both slides and moving picture films. The moving pictures brought out very plainly the sudden increase in stress on one pair of teeth when contact is broken at the preceding pair, and how this shock load on the teeth is reduced as the number of teeth in simultaneous contact is increased. Mr. Baud, who read the paper, said he believed that in a few years it would become the practice to use only gears in which at least two pairs of teeth are in contact at all times.

Louis G. Goetz, of Cleveland, presented a paper on "Knowing Your Costs," in which he addressed himself particularly to the heads of firms engaged in cutting industrial gears.

Manufacturing Costs Analyzed

He pointed out that manufacturing costs consist of three items; viz., raw materials, direct labor, and shop overhead. There is no great difficulty in properly apportioning raw material and direct labor to any particular job, and it is in connection with efforts to segregate and apply overhead expense that considerable divergence of method is met. At first, it was customary in making bids to estimate the cost of direct labor and materials and add a certain percentage for overhead and profit. Later on a certain percentage of the direct labor cost was added to the cost of labor and materials. Still later, instead of this percentage, a certain rate per hour of direct labor was used. It was then necessary to know the cost of material, the cost of direct labor, the hours of such labor necessary, and the approximate cost of overhead per hour. This cost per hour of direct labor was obtained by breaking down the items of factory overhead to departments.

Mr. Goetz said these three methods had served the purpose in a way, each during its time, and probably all three were still in use to some extent. However,

more exact knowledge, and its application in compiling cost, now produce more accurate results.

It is self-evident that overhead cost should be applied to the cost of the product in the proportion to the total overhead of the departments doing the work, which the time consumed in processing the product bears to the total available productive time of the departments in which the processing is done. This gives the equation:

Overhead to be applied =

$$\text{Processing time} \times \frac{\text{Total overhead}}{\text{Total available time}}$$

Mr. Goetz said this is a fundamental principle and any method which disregards it does not give true and accurate costs.

Machine-Hour System

The system by means of which the total overhead can be most equitably distributed is known as the machine-hour system. This was explained by the author as follows:

"To apply factory overhead on a machine-hour basis, it becomes necessary to break down the items of plant overhead not merely by departments, but by individual machines or groups of machines within each department. It is necessary also to calculate the total number of hours over a given period, which each machine or group should be used, in order to operate the plant at normally profitable capacity. By dividing this number of hours for each machine (or group) into the total overhead applicable to the machine (or group) for the same given period, there is obtained a factor which represents the 'normal' amount of overhead that should be applied to factory costs for each hour of work which each machine performs on any product. The amount of factory overhead to be applied to costs for the use of any machine is obtained by multiplying the hours that machine is used by its normal machine-hour rate."

Allan H. Candee, mechanical engineer of the Gleason Works, presented a paper on "Large Spiral Bevel and Hypoid Gears." He pointed out that machines for cutting the teeth of bevel gears divide into two classes, planers and generators. With the planers, which are the earlier type, the tooth profile is obtained from a former or templet by a direct copying method, and is planed out by the small rounded point of a single tool. The accuracy obtainable in the gear depends to a large extent on the human skill involved in making and using the former and adjusting the tool.

In generating machines, the profile curves at the sides of the teeth are produced by the relative motion, in the machines, between the tools and the gear blank, the cutting being done by the straight-edged sides of the tools. Straight-tooth bevel gears are cut by both methods by reciprocating the tools in straight lines passing through the cone apex. In the Gleason spiral bevel gear generator a circular rotating cutter is substituted for the straight-line reciprocating tools to produce spiral bevel gears or gears with curved and oblique teeth. Usually the tools work on one tooth at a time, and when that is finished the work is indexed for the next tooth.

The tooth-shapes produced by this planing method are not as accurate, and the finish is not as good, but the planer-type bevel gear cutters are considerably lower in cost. Generated gears have largely superseded the planed type, where smooth and quiet running is important.

Spiral Bevel Gears

In speaking of the tooth curves of spiral bevel gears, the spiral shape considered is always that of a tooth in the basic crown gear. There the curves lie in a plane and can be readily studied. For instance, if the tooth

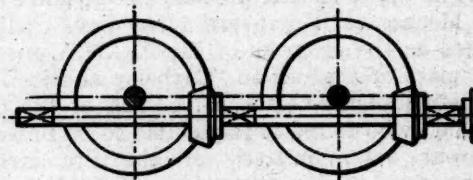
curves of a pinion are traced on a paper wrapped around the pitch cone and the paper is then unrolled into the plane pitch surface of the crown gear, the two sets of curves coincide exactly. As successive teeth represent a series of similar curves equally spaced around the common center, they are naturally called spirals.

Mr. Candee explained that the spiral bevel gear generator was originally developed to produce gears for automobile rear axles. A demand then arose for similar gears of larger size, and about 1922 this appeared to have become sufficiently large to warrant the development of generators for such gears. It was quite obvious, however, that the method of generating by means of a revolving cutter with inserted blades was not applicable to this type of machine, as the cutters would have become very expensive, and as these larger machines usually are used only intermittently, the cost must be kept down. In developing its large spiral gear generator, which was brought out in 1925, the Gleason Works therefore used a single planing tool capable of generating spiral bevel gears of diameters up to 90 in. In this machine five different simultaneous motions are used, three to determine the shape of the tooth spiral curve, and two rolling motions producing the tooth profile curves. Mr. Candee went into considerable detail in regard to these motions and the means provided in the machine to enable the operator to obtain exactly the form of tooth contact desired.

Recently this new machine has been applied also to the production of hypoid gears, and the latter can now be produced in diameters up to 60 in.

Hypoid Gear Possibilities

The author dwelt at some length on various possibilities of hypoid gears. Six different combinations of direction of offset and hand of spiral are possible. Two of these are used in automobile drives, where the pinion has a large spiral angle and the gear a small one, leading to pinions of larger diameter. It is also possible to give the gear a large spiral angle and the pinion a small one, and, finally, the spiral angles of both pinion and gear can be made equal. In general, the hand of spiral of the teeth is determined by the required direction of offset (of pinion axis relative to gear axis), rotation and pinion thrust. It was pointed out, as one advantage of hypoid gears, that the pinion shaft can be extended past the gear shaft and carry another pinion meshing with a second gear whose axis is parallel



Two hypoid pinions mounted on continuous shaft

with that of the first gear. (Such a drive might be used for six-wheeled trucks and buses, for instance).

A. A. Ross, chairman of the Committee on Herringbone Gears, made a progress report for that committee. The Association some years ago adopted a recommended practice on herringbone gears, but this has not been generally adopted and has been criticized. Mr. Ross said the members of the committee did not agree that the tooth proportions in the recommended practice were the best, nor could they agree on any definite tooth proportions. The committee offered certain changes in the present recommended practice so it might serve as a working basis until the gear art had advanced to the

point where all manufacturers would agree as to what proportions were the best.

Herringbone Recommendations

It is recommended that the pressure angle in the plane of rotation should not be less than 15 deg. 23 min. and not more than 35 deg. The minimum pressure angle corresponds substantially to the combination of a 14½ deg. normal pressure angle and the minimum helix angle recommended, while the maximum pressure angle in the plane of rotation in combination with the maximum helix angle recommended gives a normal pressure angle of 18 deg. 15 min. It is recommended that the helix angle be made not less than 20 deg. and not greater than 45 deg., that the addendum be made not less than $0.7/p_d$ and not more than $1/p_d$, and that the clearance be made not less than $0.157/p_d$ and not more than $0.3/p_d$.

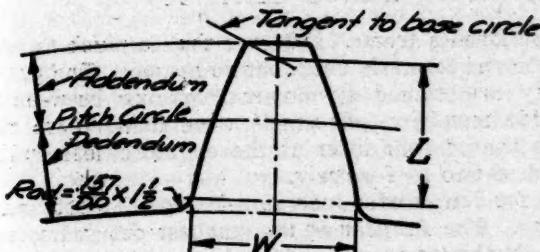
If the bottom of the tooth space is a curve tangent to the fillets of adjacent tooth profiles, the clearance is to be increased by the depth of this recess.

A rule was given in the report for increasing the outside diameter of the pinion blank to eliminate undercutting of pinion teeth and secure full involute action. Backlashes for different diametral pitches are specified for both industrial and special high-speed gears.

A formula is given for the permissible maximum tooth load, viz.,

$$TL = \frac{y S K}{p_d P}$$

where y is the tooth form factor $W^2/6L$ (see drawing);



Proportions of herringbone gear tooth

S , the allowable static stress K , the velocity factor and P , a wear and lubrication factor. S is given as 15,000 lb. p. sq. in. for alloy steel heat-treated to 60,000 lb. p. sq. in. elastic limit before cutting, and 12,500 lb. p. sq. in. for 0.40-0.50 per cent carbon steel heat-treated to an elastic limit of 50,000 lb. per sq. in. before cutting. The velocity factor $K=78/$ (78+pitchline velocity in ft. p. m.), and the wear and lubrication factor is to be made 1.15 if the gear is enclosed and well lubricated. The above equation for tooth load is applicable only if the addendum and pressure angle are such that the number of teeth in contact in the plane of rotation is at least 1.5 and both the load and source of power cause no shock loads on the teeth but permit of smooth, uniform operation.

Alloy Steel Practice

The Metallurgical Committee, of which C. B. Hamilton is chairman, made a report in which a list of alloy gear steels was offered for adoption as recommended practice. All of these steels had a 10 point carbon range, the same as the present S. A. E. steels. Written discussion by S. O. White, chief engineer of the Warner Gear Company, was presented in which Mr. White asked that steels Nos. 2845 and 5150 (S. A. E. designations) be included in the list. Mr. White also ob-

jected to the use of a 10-point carbon range. This latter point was further stressed by Perry L. Tenney of the Muncy Products Corporation, who thought that the specifications were behind the times, as automotive gear manufacturers had long insisted upon a narrower carbon range. In the case of his own company, they had been using steel with a 5-point carbon range during the past seven years. They were getting this steel without paying a special price, and if the 5-point range were included in the specifications it might have a salutary effect on the steel industry and assist the smaller gear makers in getting steel with these closer limits, without paying extra therefor. Mr. Hamilton agreed with Mr. Tenney that a 5-point range was desirable in the low carbon case hardening steels, but could not see its advantage in the higher carbon steels. Mr. Tenney also objected to the low carbon content specified in some of the nickel steels. His firm had been using a 5 per cent nickel steel in truck transmissions and started out by using 12 points of carbon (2512 steel) but increased the carbon content to 20 points. He held that with such a low carbon content one does not get the actual value of the nickel in the steel.

The report also contained amended specifications for forged and rolled carbon gear steels, amended specifications for cast steel and for non-ferrous gear materials. It was brought out that the S. A. E. Iron and Steel Committee is at present considering a revision of its steel specifications, and in view of this fact it was decided to change the status of the entire report to that of a progress report and give it further consideration.

Proposed American Standard

H. J. Eberhardt, chairman of the Tooth Form Committee, reported that the 14½ and 20 deg. full-depth involute systems of gearing adopted by the A.G.M.A. in 1927 are now being considered by the American Standards Association for adoption as American Standards. The proposed American Standard covers two distinct items, namely, the proportions of the basic rack for each of the two systems of gearing, and a list of diameter increments for pinions of different numbers of teeth which will just eliminate undercutting. These long-addendum pinions can be used together with short addendum gears, in which case the system is not interchangeable, as the gear has to be made to suit the pinion. On the other hand, if the center distances are not fixed, a long addendum pinion can be used together with a gear of standard addendum, in which case, however, the pressure angle will be changed.

It had been suggested that the diameter increments listed should be extended downwardly to include pinions with eight and nine teeth for the two systems. This matter was taken up at a committee meeting held during the session, at which it was decided, however, to fix the minimum number of teeth for each system at twelve. While it is possible to cut and use pinions with a smaller number of teeth, these should be regarded as special.

At the committee meeting, which was really a joint meeting of the A. G. M. A. Tooth Form Committee and the Sectional Committee on Gearing of the American Standards Association, some interesting light was shed on the subject of tooth form standardization in general. Some of the members of these committees apparently look forward to the time when there will be only a single standard tooth form, and Chairman Eberhardt stated that the German Engineering Standards Committee had adopted a single standard, the 20 deg. pressure angle, full-depth tooth. The A. G. M. A. at present has four different standards, namely, the composite 14½ deg. pressure angle tooth (Brown & Sharpe

system), the 20 deg. pressure angle stub tooth and the 14½ deg. and 20 deg. full depth involute teeth.

The 20 deg. pressure angle and the stub form were introduced to eliminate undercutting in pinions with small numbers of teeth and thus add to the strength of such pinions, and where strength and compactness are essentials the 20 deg. stub tooth is used almost exclusively. However, smoothness and silence of operation is an important consideration in many forms of gearing, and from this point of view the smaller pressure angle and the longer tooth have advantages. The smoothness of action of a pair of gears is dependent upon the number of teeth in contact simultaneously, which varies directly as the proportion of the tooth working depth to the circular pitch and inversely as the square of the sine of the pressure angle. Another point to be considered in this connection is that failure of gears of the better materials generally is due to pitting near the pitch line and not to stripping of the teeth, and pitting can be eliminated by increasing the number of teeth in contact by increasing the depth of tooth and decreasing the pressure angle. Thus the short and high pressure angle tooth has the advantage of greater resistance to stripping, while the long and low pressure angle tooth offers greater resistance to pitting and tends toward smoother action. From this it would seem that there is little hope of agreeing on a single pressure angle and a single proportional working depth for all purposes. It was also brought out in the discussion at this meeting that a 17-tooth 20 deg. pressure angle full depth pinion

—which is the smallest pinion of this general type with which there is no under cutting theoretically—is decidedly less smooth in operation than a 15-tooth 20-degree, full-depth pinion, which has a definite undercut.

Offer Revised Nomenclature

The Bevel Gear Committee offered a revision of the Bevel and Spiral Bevel Gear Nomenclature submitted by it a year ago, and the Nomenclature Committee submitted a progress report on nomenclature for involute external and internal, helical and herringbone gears.

On Friday afternoon many of the members went on a trip of inspection to the gear and forge plants of Gears and forgings. On Friday evening, the annual banquet was held. F. W. Sinram acted as toastmaster, and addresses were made by Carl Schuler, law director of the City of Cleveland, President A. F. Cooke of the Association, and George L. Markland, Jr.

Five new members of the Executive Committee were elected, four in regular rotation and one to fill the unexpired term of E. J. Frost, resigned. The members elected to the Executive Committee for the regular term were Messrs. Waterman, Markland, Christensen and Diefendorf, while Mr. Sawtelle was elected to fill out the unexpired term of Mr. Frost. No action was taken on the election of officers nor on the selection of a place for the fall meeting, and it is understood that these matters will be taken up at a meeting of the Executive Committee to be held in New York City on June 10.

Many Refinements in Indianapolis Race Entries

WITH 1929 the last year for 91½ cu. in. cars at Indianapolis next week one might think that their owners would not be inclined to do much to them to prepare them for the seventeenth annual international sweepstakes, but such is not the case. Many refinements mark the American cars while several departures from American practice are conspicuous in the foreign entries.

As in 1928, intercoolers between the supercharger and engine are much in evidence, several entries being equipped with them this year that did not have any last year.

A feature of Cliff Durant's Detroit Special, on which Tommy Milton has spent much time since last year, is the further development of the two-stage G. E. supercharger.

Looking into the cars carefully, it is seen that connecting rods are made heavier to prevent their changing length under the strain of starting and stopping the pistons as fast as 14,000 times a minute.

One of the cars entered by W. S. White is a Duesenberg chassis with a 91 cu. in. Miller engine and an especially rugged Mercedes with a four-speed transmission. The purpose of this transmission is to fit the car for participation in foreign road racing events.

One of the Packard Cable entries is a new rear-drive Miller, incorporating, as did also the other two Packard Cable entries, a new and stiffer crankcase. The purpose of this case is to give better support to the crankshaft.

Better control at high speed is brought about by developments in frame design. The W. S. White entry, previously referred to, has a frame made of two sections of 16-gage steel—about the thickness of a fender—surrounding a wooden inner frame. It will be remembered that this design, executed in duralumin, has characterized the Duesenberg racers of the last four years.

Riley Brett, mechanic and manager for Louis Meyer,

has developed a frame for Meyer that is much stronger than the one formerly used, but no heavier. The greater rigidity is obtained by diagonal bracing between the two side members. Channels were made more rigid by the use of four bolts at the engine case mounting instead of two as formerly.

The foreign entries include a Delage, Talbot and an Amilcar. The Amilcar is the smallest entry, having a piston displacement of only 78 cu. in. for its six cylinders. The hardened crankshaft is carried on six roller bearings and its connecting rods are also roller bearing equipped. Wear is taken up by installing larger rollers. The maximum horsepower, which is 118, is developed at 6700. A Roots type supercharger, directly connected to the crankshaft, is used. The wheelbase is only 86 in. The gear ratio is 12.53. As it weighed 1320 lb., it was necessary to increase its weight 80 lb. to conform to A.A.A. requirements. That was done by placing a 40-lb. length of lead pipe in each side member of the frame. It is noticed that the driver sits very low. This is accomplished by placing the engine and driveshaft off center to the left so that the driver sits to the right. A four-speed transmission is used.

Both the Delage and the Talbot are straight eights with roller main and connecting rod bearings. Unique in the Talbot is the girder-like frame that is so deep that it forms the side of the body. The Delage has a five-speed transmission, the fifth speed being geared up to fit the car for European road racing.

A COPY has been received of the Catalogo dell' Industria e del Commercio Italiano dell' Automobile (Catalogue of the Automobile Industry and Trade of Italy), which is published by the Automobile Club of Milan. It is patterned after the Handbook of Gasoline Automobiles, one page being devoted to specifications and an illustration of each model of Italian vehicles.



Books for the Business Bookshelf

If You Want to Fly

Alexander Klemin, Coward-McCann, New York.

THIS book is intended to help make the young generation air-minded. It is in the form of a narrative of a boy whose uncle has been in the Air Mail and has started a flying service of his own account. The boy has a natural bent toward flying, and in the course of the story the various principles underlying flight are explained to him in simple language and with the aid of sketches. The author of the book is connected with the Daniel Guggenheim School of Aeronautics of New York University. The book has an introduction by Harry F. Guggenheim, president of the Fund.

How to Analyze Cost

Coleman L. Maze and John G. Glover, Ronald Press Co., New York. 389 pp. \$5.

ALTHOUGH considerable time and expense are being devoted to the collection of cost data by business concerns, the authors believe that too frequently the cost data collected are not used to full advantage by executives. This is because either the reports submitted have not been prepared with sufficient regard to the needs of executives, or the executives themselves show a lack of ability or disinclination to give full weight to the facts revealed by the cost accounting system. The present volume is written to assist both accountants and executives with this problem. It presents a detailed analysis of the major elements of manufacturing, selling and administrative costs, and sets forth procedures for determining the causes of their variation from the figures of previous periods or from predetermined estimates. Written as it is with the executive problem in mind, this book should be of considerable value to those desiring to obtain full value from their cost accounting system.

Samples, Demonstrations and Packaging

Norman Lewis, The Ronald Press Co., New York. 250 pp. \$4.50.

THIS book discusses the use of sampling as a means of advertising a product. It probably will have little application to vehicle manufacturers, but should offer ideas of value to makers of parts and accessories. The general method employed in the book is to relate the experiences of various organizations which have used sampling with an attempt to analyze their successes and failures.

Executive Business Law

By Harry A. Toulmin, Jr. D. Van Austin Co., Inc., New York. 786 pp. \$6.

THIS book is written by a practicing lawyer, with long experience as counsel for manufacturing and commercial interests, for business executives to give them something which can be used as a desk manual for constant reference in the solution of business problems. The book is divided according to the functions of business, rather than of law, so that it is particularly easy for a business executive without legal knowledge to find the information he requires for any particular

business problems. After a section on the general principles of law, the author discusses the law of business organization, the law of property rights, the law of business relations, the law of financial relations, the law of transportation problems, the law of public relations, the law of business difficulties, and the law of business crimes and personal responsibility. In consideration of the very great influence which legislative acts, both Federal and State, have upon business operations, this book should be very valuable indeed to business managers and administrators.

Omnibus Lighting and Starting

Dave K. W. Houghton, The Fanfare Press, 112 St. Martins Lane, London. W. E. 2. 49 pp. 2s. 6d.

THIS little book consists of reprints of a series of articles published in Motor Transport, England, which reviews all the factors concerned in bus lighting, both internal and external. While written primarily for British readers, it still contains a good bit of information which should be of interest to bus manufacturers and operators in this country.

Materials Hand Book

George S. Brady, McGraw-Hill Book Co., Inc., New York. 428 pp. \$4.

THIS book is an encyclopedia giving in convenient form the chief distinguishing data on the raw materials of engineering and manufacturing. It includes the general materials, whether raw, semi-finished or finished, as well as proprietary materials sold under a trade name. The descriptions of material groups and of individual materials are alphabetically arranged and range from abrasives through building materials, cupronickel, alloys, finishing materials, heat-resistant alloys, industrial chemicals, oils and greases, refractories, steels and white metals to wood. An appendix contains tables of units of measure, conversion factors, foreign units, etc., and the standard classifications for the marketing of iron and steel flat materials.

Publications Received

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS—Report No. 297, The Reduction of Observed Airplane Performance to Standard Conditions, by Walter S. Dishl.

TECHNICAL MEMORANDUM NO. 500—Remarks on Airplane Struts and Girders under Compressive and Bending Stresses. Index Values. By Herbert Wagner.

TECHNICAL NOTE NO. 302—A New Method for the Prediction of Airplane Performance, by E. P. Lesley and E. G. Reid, Stanford University.

TECHNICAL NOTE NO. 304—Corrosion Embrittlement of Duralumin, by Henry S. Rawdon, Bureau of Standards.

AIRCRAFT CIRCULAR NO. 90—The Boulton & Paul "Partridge" (British) All-Metal Single-Seat Fighter.

TECHNICAL MEMORANDA NO. 499—Danger of Ice Formation on Airplanes, by W. Kopp.

Indianapolis Race Rules for 1930 Embody Commercial Possibilities

*New regulations governing annual classic expected by executives
to develop faster stock models especially adaptable
for use on express toll roads.*

By C. EDWARD PACKER

THE subject "Racing Cars for 1930" attracted unprecedented attendance of race drivers, factory engineers and others at the Indiana Section meeting of the S.A.E. held last Saturday evening at the Severin Hotel in Indianapolis.

Fred Duesenberg as chairman opened the meeting by asking Harold Blanchard, technical editor of *Motor*, to read the rules laid down for cars that will compete in the May 30, 1930, Indianapolis race. He read as follows:

"1. *Cars Eligible for Indianapolis, May 30, 1930*—In general, specifications laid down for the above race are designed to produce either (a) a car susceptible of adaptation from production car chassis, or (b) develop cars that embody new engineering principles or adaptations as contrasted with what may be termed 'normal' cars. All cars must pass satisfactorily the inspection of the Race Technical Committee as to safety of design and construction. Otherwise, full freedom is given within the general restrictions imposed in the following rules.

"2. *Displacement*—Cars will be limited to a maximum piston displacement of 366 cu. in. or 6 litres.

"3. *Wheelbase*—There will be no restriction on wheelbase other than the general restriction that the car must be handleable.

"4. *Weight*—A minimum weight of $7\frac{1}{2}$ lb. per cu. in. of displacement is fixed with a final minimum weight irrespective of displacement of 1750 lb. The weight shall be that of the completed car but without fuel, oil or water.

"5. *Tread*—The tread measured at the center of the

tire contact with the road must lie between 54 and 60 in.

"6. *Body Type and Measurements*—The cars must have bodies with two seats with the body width across the driver's seat not less than 31 in. at the base of the seat. The seat for the mechanician must be alongside the driver, although it may be staggered not more than 12 in. with respect to the driver's seat.

"7. *Valve Mechanism*—In poppet type gasoline engines a limit of two valves per cylinder is placed. No restriction is placed on the number of valves in any other type; for example, sleeves, rotary valves, and so on, or in Diesel engines.

"8. *Supercharger*—On four-cycle gasoline engines, supercharging is prohibited. A positive displacement supercharger may be used on two-cycle or Diesel engines.

"9. *Carburetors, Number of*—Not more than two carburetors may be used on four-cycle gasoline engines. A duplex carburetor, even though it has but one float chamber, will be considered as two carburetors. No restrictions for 1930 will be made in the number or type of carburetors or manifolding in the case of two-cycle, Diesel, or semi-Diesel or turbine engines.

"10. *Brakes*—Two independently operated systems of brakes will be required on every car. The secondary system must not be vulnerable to any failure of the primary system. The primary system must operate effectively on all four wheels and be capable of continued use without failure and of arresting the car within reasonable limits. A standard test as to braking effectiveness will be devised by the Indianapolis Race Committee.

"The secondary system need be effective on but two wheels and must be capable of stopping the car from 100 miles an hour speed not less than five times in succession without failure.

"11. *Transmission*—The transmission must incorporate a declutching device and a reverse as well as a forward speed."

After Mr. Blanchard had thus reviewed for the audience the new rules, Mr. Duesenberg called on Edward Herrick of Lycoming for his opinion of what the developments would be.

"As I see it," said Mr. Herrick, "these rules will do much to put race



Straight eight Delage to be driven in 500-mile race on Memorial Day
by Louis Chiron

cars on a commercial basis. Furthermore, they will encourage developments in valve design and also in two-cycle construction. There is no doubt that the ingenuity of race drivers and their mechanics will do much to improve the product that we now have."

Colonel William Guy Wall, a past president of the S.A.E., stated that it was very speculative as to whether the new cars would tend to run toward the high or low limit of allowed size. He also mentioned that there was no way of telling whether the present popular straight eight, a "V," or possibly a radial would be most popular next year, or how many cylinders it would have.

Because of the limitation to two valves, Colonel Wall felt that cylinder bores would be kept down, and displacement obtained by increasing the number of cylinders.

He mentioned also that it was certain that manifolds would be refined for utmost volumetric efficiency. Another possibility he mentioned was the use of ethylene glycol as a cooling agent in the radiator, since that fluid would make possible a smaller radiator and hence assist in getting good streamlining.

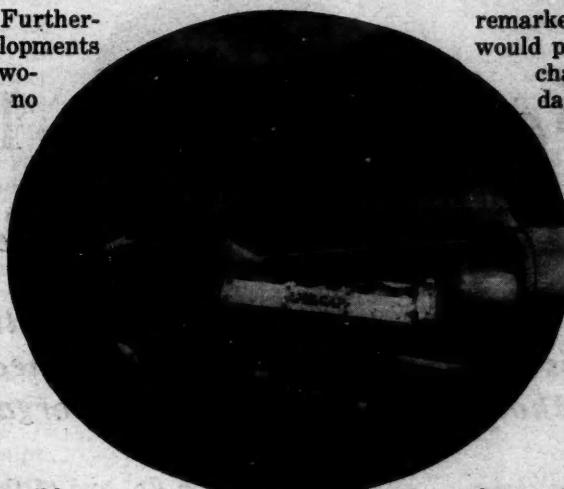
"I have no doubt," said Colonel Wall in closing, "that the 1930 race will be the most interesting yet run and will be the direct cause of faster stock cars."

T. J. Little, chief engineer of the Marmon Motor Car Co., read the following from a paper that he had prepared: "I feel that these new rules will ultimately result in better stock cars by adding the brains of race drivers and mechanics to those of other automotive engineers. It is to be hoped that these men will work closely with manufacturers in developing these new cars. Indianapolis Motor Speedway is an invaluable test ground as its brick surface sets up vibrations that put any car to a real test.

"That we will eventually have high speed, or express, toll roads in this country as are now so successfully used in Italy seems certain. In this connection, I wish to remind you that the new rules will do much to develop a car that will make the most of such roads."

Waldo Stein, of Firestone, spoke on the tire problems that will develop with the various sizes and weights of cars that will appear. He frankly admitted that it was impossible for him to say—or for anyone to say—just what tire performance could be expected with cars of various weights, power and gear ratio. He expressed confidence that it would be possible to produce tires to stand up well under the proposed cars the same as under the smaller race cars.

Ralph R. Teetor, vice-president, charge of engineering, Perfect Circle Co.,



View of powerplant of Amilcar, the smallest entry for the race

remarked that piston ring characteristics would probably be about like piston ring characteristics desired in present-day high speed cars. The problem of correct ring design would be aggravated, he said, by the 50 per cent extra clearance that would probably be given to pistons.

While engineers and many others seemed to feel that the change in rules would eventually benefit all concerned, most of those who owned or drove the 91½-in. cars were opposed to the new rules.

The objections were headed by remarks contained in a letter from Harry A. Miller, president, Harry A. Miller, Inc., Los Angeles, who will be unable to attend the race this year and who was not at the meeting.

Bert Dingely read Mr. Miller's letter, which said in part: "It seems to be a backward step to go to larger engines and to drop the superchargers, especially when there was reason to believe that they would eventually be suitable for commercial application. Furthermore, I object to the extra hazard of having two men ride, especially as it is quite unnecessary as races are now run, to have a mechanic along."

Louie Schweitzer, of Schweitzer-Cummins Co., of Indianapolis, made substantially the same remarks about superchargers that Mr. Miller made.

Race drivers and others who expressed disappointment in the new rules included Leon Duray, Ralph DePalma, Harry Hartz, Wade Morton, Lee Oldfield, Tommy Milton and Louis Chevrolet.

Because of the objections raised, Fred Duesenberg suggested that a special meeting of drivers and others concerned be called soon after the May 30 race to smooth out all problems to the best advantage of all.

As next year's race will be run with many changes in the rules, it might be inferred that owners with cars entered for next week's contest would make only indifferent preparations. On the contrary, both American and foreign entries have introduced refinements and changes in engine design of many and various descriptions. Among the 46 entries at Indianapolis this year are three foreign cars—a Delage, Talbot and

an Amilcar, views of which are shown herewith which have unusual features. Outstanding refinements of these and several American entries are described in a separate article to be found on page 810 of this issue. Included in the extensive preparations are greater use of intercoolers between superchargers and engine than last year, heavier connecting rods and several unique frame constructions.

Harvey S. Firestone, president of the Firestone Tire and Rubber Co., will referee this year's Indianapolis race.



Head-on view of straight eight Talbot that is entered for the Indianapolis race

General Motors' Fokker Investment Makes It a Factor in Aviation

No change in management or operation of the airplane company is expected until its directors meet, according to Anthony Fokker, founder of the organization.

UNTIL the directors can meet sometime within the next three weeks, there will be no change in the management or operations of the Fokker Aircraft Corp., according to Anthony H. G. Fokker, consulting engineer of the company. Operations at the Hasbrouck Heights, N. J., and Wheeling, W. Va., plants will be continued as heretofore and the present officers will retain their posts.

Construction of the plant projected on the Pacific Coast is being delayed until any changes in policy resulting from the acquisition of a large portion of Fokker stock by General Motors can be definitely determined. It seems improbable that there will be any change in officers other than the addition of one or two General Motors executives in order that the corporation may be represented.

By the relatively simple process of purchasing the treasury stock of the Fokker Aircraft Corp. of America, and attaining virtual control of the company, the General Motors Corp. definitely has entered the production end of the aviation industry, extending and supplementing its recent indirect entrance through participation in the formation of the Bendix Aviation Corp., which was viewed by many observers as marking the beginning of large-scale participation in the industry by General Motors.

Entrance of General Motors into the Fokker Corp., manufacturers of tri-engined transport planes, raises the number of large affiliated groups in the aviation industry to seven, and places General Motors in direct competition with the Ford Motor Co., which is the principal competitor of Fokker in the manufacture of multi-engined transport planes.

Two aviation combines heretofore have claimed to be the "General Motors of the aviation industry." They were the United Aircraft & Transport Corp., headed by the Boeing Group of companies and financed largely by the National City Co., and the Aviation Corp., a holding company which controls the Fairchild interests, and is financed by W. A. Harriman & Co. and Lehman Bros.

Other groups looming large on the aviation horizon at present are the Curtiss companies, grouped about C. M. Keys, president of Curtiss Aeroplane & Motor Co., and the Wright companies, in which Richard F. Hoyt, chairman of the board of Hayden,

Stone & Co., and of the Wright Aeronautical Corp., is the central figure, and the Bendix Aviation Corp., headed by Vincent Bendix, in which General Motors owns 25 per cent of the stock and has multiple representation on the board of directors.

The Fokker Aircraft Corp. of America is possibly the most important of the 60 or more "independent" companies now engaged in the manufacture of airplanes and accessories in the United States. At the beginning of the year, unfilled orders on its books were valued at \$3,000,000, and it was estimated that the gross business for 1929 would reach \$6,000,000. Feb. 5, the Fokker Corp. contracted with the Wright Aeronautical Corp. and the Pratt & Whitney Mfg. Co. for 350 airplane engines with a total value of \$2,400,000, one of the largest single contracts in the history of the aviation industry.

The company was incorporated in Delaware in December, 1927, to acquire the share capital of the Atlantic Aircraft Corp., formed by Anthony H. G. Fokker in 1923. The growth of the Atlantic Aircraft Corp. had been rapid and sales were accelerated by the formation of the Fokker Aircraft Corp. and the addition of new capital. In 1925, sales of the Atlantic organization were \$359,000; in 1926, \$760,000; in 1927, \$842,000; and in 1928 sales of the Fokker Aircraft Corp. were

estimated to have reached \$2,000,000. James A. Talbot, president of the Richfield Oil Co., California, is chairman of the board of the company and the president is Harris M. Hanshue, head of Western Air Express, a large stockholder in the corporation.

On Feb. 28, 1929, stock of the Fokker Corp. was listed on the New York Curb to the amount of 510,000 shares on no par value, out of 1,000,000 shares authorized. No dividends have been reported to date. Assets of the company are listed as \$4,459,725.*

The company maintains plants at Teterboro, N. J.; Passaic, N. J., and Glendale (Wheeling), W. Va. A plant at Los Angeles with an annual capacity of 3000 planes has been projected.

Announcement of General Motors' purchase of control of the American corporation came from James A. Talbot, chairman of the board of the Fokker Aircraft Corp. of America, and was dated May 17. The purchase was

Anthony H. G. Fokker, founder of the company bearing his name, in which General Motors has a large interest

* In addition, the stock is listed on the Amsterdam Bourse, where the stock of the original Dutch Fokker companies, formed by Anthony H. G. Fokker, is also traded.

stated to include 400,000 shares of the no par value common stock, for which General Motors will give the Fokker Corp. all the capital stock of the Dayton-Wright Co., which owns McCook Field, Dayton, Ohio, and controls a large number of patents relating to the aviation industry. General Motors will turn over additional cash assets to the amount of about \$6,500,000. This arrangement is said to be the culmination of negotiations which have been under way for several months.

Anthony H. G. Fokker, a large stockholder in the Fokker company, will remain with the company in charge of engineering and design. The present personnel of the company will be continued in operation, and supplemented with additional men from the General Motors Corp.

Fokker products include a group of transport planes headed by the Fokker F-10, a tri-engined model, an amphibian, now being tested, a flying boat, two types of single-engine cabin planes; the Fokker Universal, powered with a Wright 200 hp. engine, and the super Universal, powered with a Pratt & Whitney Wasp, one of which Commander Byrd took with him to the Arctic. Interest, however, centers at present around the large transport models, which are used by Western Air Express and other transport lines, and which have constituted the most important part of the Fokker business.

Transfer of McCook Field to the Fokker Corp. is regarded as an indication that planes may be built there, but it was stated that there is no intention to discontinue the manufacture of Fokker planes at the other factories already in operation.

Other directors of the Fokker company besides Mr. Talbot and Mr. Hanshue are T. C. Gregory, San Francisco attorney, and H. A. Reed, of New York, secretary and treasurer of the company.

Anthony H. G. Fokker, founder of the company, came into prominence during the World War. He first offered the design of his planes to some of the Allied powers and being turned down, produced hundreds of planes for the German army. Fokker planes were consistently appearing in war dispatches regarding aviation activities of Germany. At the close of the war, Mr. Fokker turned his attention early to the commercial development of aviation. He came to the United States in 1919, formed the Atlantic Aviation Corp. and has since



C. E. Wilson, newly elected vice-president of General Motors, who was active in the purchase of Fokker stock

become an American citizen. The production of transport planes will be continued in the Holland plants which manufactured aircraft for the German army during the war.

Although there have been numerous rumors for some time past that General Motors was acquiring an aircraft enterprise, officials of the corporation were taken by surprise by the announcement that General Motors had acquired a 40 per cent interest in the Fokker Aircraft Corp. While no statement is forthcoming from General Motors offices, it is intimated that C. E. Wilson, recently elected vice-president of General Motors, was active in the consummation of the deal, and it seems probable that he will be among the General Motors executives appointed to represent the corporation on the staff of Fokker.

Inasmuch as the purchase takes in only 40 per cent of the Fokker stock it is believed that the General Motors investment in the company will be similar to a number of other investments where the companies are affiliated with but not consolidated in the corporation. Whether the Fokker Aircraft Corp. will later become a division of General Motors seems as yet undetermined, but it is regarded as unlikely for the present.

Companies recently affiliated with General Motors include the Yellow Mfg. Co., the New Departure Mfg. Co., the AC Spark Plug Co., Vauxhall Motors, Ltd., Delco-Remy and Hyatt, Ltd., Bendix Aviation Corp., and, so far as can be learned, Opel Motor Works of Germany. In each of them General Motors Corp. owns an equity in the dividends, due to stock control, ranging from 100 per cent in the case of Vauxhall Motors and General Motors Acceptance Corp., to 25 per cent in the case of Bendix Aviation Corp. The usual policy of the company appears to be the purchase outright of about 40 per cent stock interest in affiliated companies, and interposition of General Motors management of strength adequate to insure their profitable operation. It is probable that General Motors, for the present, will continue the Fokker organization on the basis of an affiliated company without making any drastic changes in the management personnel. This statement is borne out by the declaration of Anthony H. G. Fokker. In the future The Fokker Aircraft Corp. may become an integral division of General Motors Corporation.

Recent model of Fokker tri-motored monoplane made especially, for a General Motors official



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News Industry

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NUMBER 21

Record May Output Likely Despite Factory Declines

PHILADELPHIA, May 25—Production of automobiles and trucks, considering the manufacturers as a whole, appears to have dropped somewhat below the record-breaking pace of last month. Information gathered from a large number of the factories, however, indicates that the decline in output has not been great, compared to the seasonal recession in other years, and—as was pointed out in *Automotive Industries* last week—it is quite probable that a new record production for the month of May will be established. The present high record for the month of May was set in 1928 when the factories of this country and Canada turned out 459,725 vehicles. Reports from various sections of the country show retail sales continue to be generally favorable but spotty.

Executives at the automobile factories are particularly vigilant at this time in watching the trend of retail sales. It is upon intensive study along this line that production schedules for the next several weeks are to be based. A number of company officials have voiced the opinion that the aggregate production will be continued at a high rate in June. Reports from parts suppliers indicate that parts commitments from automobile manufacturers for next month presuppose a high output for that time of the year.

Bearing out the reports of spotty conditions relative to new car sales, some manufacturers indicate difficulty in filling orders, despite well-sustained high output. Producers of other makes find that they have sufficient cars on hand to take care of immediate demand and to assure prompt delivery. It has been estimated that new car stocks in the field represent approximately a 40 days' supply, considering all makes of cars in one total.

Champion to Expand Plant

DETROIT, May 23—Champion Spark Plug Co. will make extensive expansion of its factory in Windsor, Ont., providing for an output three times as large as at present, according to R. A. Stranahan, president of the company.

Lincoln Output at Peak

DETROIT, May 24—Production of Lincoln motor cars for the first three months of 1929 averaged 40 a day, which is the maximum schedule for the Lincoln plant, and an increase of seven cars a day over production for the same period last year.



Philadelphia, Saturday, May 25, 1929

Car Built in 1906 Brings Owner \$1,500

HAWTHORNE, NEV., May 22—Martin Chiatovich has found a buyer for his 23-year-old automobile after a wait of 22 years, it is reported here by the Associated Press. He received an offer from the Smithsonian Institution of Washington for \$1,500 in return for his 1906 Pope-Hartford touring car, including the bucket seats. Chiatovich, in accepting the offer, said the car ran as well as it had 15 years before, but it burned too much gasoline.

Packard Directors Vote Stock Split

DETROIT, May 23—Directors of the Packard Motor Car Co. met here yesterday and recommended a five for one split of capital stock, issuing five shares of no par value for one share of the present \$10 par value stock. Stockholders of the company will vote on the proposed change at a special meeting to be held June 19.

The directors also declared a cash dividend of \$1.50 per share payable July 31 to holders of \$10 shares of record July 12. This would mean \$4,506,396 on the 3,004,264 outstanding shares. It is expected that regular dividends will be paid on the new no par value shares at the rate of \$1 a year or 25 cents quarterly.

Rockford Drilling Sold

CHICAGO, May 23—Officials of the Rockford Drilling Machine Co., Rockford, Ill., announced last night that negotiations were completed during the day for the acquisition of the company by Borg-Warner. Transfer of the assets would be completed within a week, it was said.

Ford Three-Window Model Out

DETROIT, May 22—Production of the three-window Fordor sedan is well under way, according to an announcement by the Ford Motor Co. This model presents a number of changes, including greater body room. The price is \$625 at the factory.

N.A.C.C. Will Discuss Export Field Problems

NEW YORK, May 23—The National Automobile Chamber of Commerce will hold a meeting for the discussion of exports on June 6 at its headquarters in this city, it was announced today. The discussion will come under four main topics as follows:

"What Are the Obstacles to Exports and How Can They be Overcome?" with discussion led by G. M. Williams, Marmon president, and J. E. Fields, of Chrysler Motors. "What Bearing Will the U. S. Tariff Have on this Problem?" led by B. C. Budd of Packard and J. S. Draper, of Hudson. "The Problems of Export Advertising, Selling and Service," led by Rufus Cole, of Hupp, and R. G. Hudson, of Reo. "What Can be Done to Expand Exports to Specific Countries?" led by J. D. Biggers of Graham-Paige, and Althoff, Brazilian representative of Studebaker.

Grant to Address Advertisers

DETROIT, May 22—R. H. Grant, vice-president of the General Motors Corp., will speak on "The New Responsibility of the Advertising and Selling Executive" on Monday evening, May 27, before the Association of Natural Advertisers at French Lick, Ind. The program of speakers also includes Frederick Dickinson, of the Hupp Motor Car Corp., and G. W. Cushing, of the Graham-Paige Motors Corp.

Austin to Build Cars in America

Pending Deal Looks to Purchase of Standard Steel Car Plant

PITTSBURGH, May 21—Negotiations are in progress between a new American subsidiary of the Austin Motor Co., Ltd., English automobile manufacturer, and officials of the Standard Steel Car Co., of this city, for the purchase by the automobile company of part of the latter's plant at Butler, Pa. The Austin automobile, it is understood, will be manufactured at Butler upon completion of the transaction. Final investment will represent several millions of dollars, it is said.

The deal, which is expected to be closed within a short time, covers the purchase of the Butler plant, where formerly the Standard automobile which went out of production several years ago, was manufactured. This plant is approximately 800 ft. long. Auxiliary ground space machinery was removed from the building years ago. It was declared here that, if the deal is completed, the Mellon interests will have no connection with the new automobile plant. It is said that the automobile will sell in this country for approximately \$450. Deliveries are to commence around the first of 1930 and the plant is said to have capacity for about 50,000 cars a year.

One banking firm interested in the pending transaction is Bulkely, Vallance & Co., 100 Broadway, New York City. The Austin company is represented in New York City by H. H. Stockfeld, 500 Fifth Ave. Both Mr. Stockfeld and Bulkely, Vallance & Co. declined to give any information.

In 1914, the Standard Steel Car Co., whose primary interest is the manufacture of freight cars, produced a six-cylinder automobile. Later, the company developed an eight-cylinder model, and peak production was reached in 1917 when about 2500 cars were turned out in the Butler plant. Production ceased in 1922, when Don C. McCord took over the automotive end.

Billings Elected Director

NEW YORK, May 22—Union Carbide & Carbon Corp. has elected C. K. G. Billings chairman of the board. Mr. Billings, who is a director and head of the executive committee, succeeds George O. Knapp, who was elected honorary chairman.

G. M. Rumor Unconfirmed

INDIANAPOLIS, May 23—M. A. Gilman, president of the Allison Engineering Co., of this city, declined to make any statement today concerning the report that General Motors had acquired the company, and he suggested that the request for information be directed to General Motors. At the

General Motors New York office, no official statement either denying or confirming the report was released.

New Era Motors Announces Officers and Directors

NEW YORK, May 22—Officers and directors of New Era Motors, recently organized for the manufacture of the Ruxton front-wheel drive automobile, were announced today at the office of the corporation at 17 East Forty-fifth Street. A. M. Andrews, president of the Andrews Investment Corp. and actively associated with the Dictograph Co. and with Trans-Lux Daylight Co., is president of the new corporation; W. H. Muller of the Edw. G. Budd Mfg. Co., Philadelphia, designer of the car, is vice-president, and Stanley Nowak of the Dictograph Co. is treasurer, F. E. Welsh, secretary, and G. H. Eichberger is counsel.

In addition to the officers, the directors are Fred. W. Gardner, vice-president of Gardner Motor Co.; C. Harold Wills, one-time chief engineer of Ford Motor Co. and now consulting engineer in the automotive field; R. E. Allen, vice-president of Central Union Trust Co.; P. N. Furber, Trans-Lux Daylight Co., and William V. C. Ruxton, partner in the investment house of Spencer, Trask & Co.

Mr. Andrews has announced that the Ruxton car will be produced in two plants, one at St. Louis and the other at Cleveland. It is expected that 500 sedan models will be ready July 1.

Allied Industries Seeks Wills Ste. Claire Plant

DETROIT, May 22—Allied Industries, Inc., Detroit, of which William R. Wilson is president, is negotiating for the purchase of the Wills Ste. Claire plant at Marysville, Mich., it has been learned authoritatively. The deal, pending the clearing up of certain legal details, is expected to be completed within the next few days.

It is understood that Allied Industries will use the properties at Marysville to take care of its expanding interests, but officials of the company are not yet ready to announce the specific purpose. The property consists of 140 acres with 3100 ft. on the water front and a depth of 800 ft. There are two plants in the northeast corner having some 350,000 sq. ft. of floor space.

G. M. Export Men Meet

STROUDSBURG, PA., May 22—The first conference of the managing directors of the General Motors Export Division was opened here today at the Buckwood Inn Country Club with an address of welcome by J. D. Mooney, vice-president of General Motors in charge of overseas operations.

N. J. Sales Increase

NEW YORK, May 22—New car registrations in New Jersey during April were 15,725 as compared with 12,871 in March.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

NEW YORK, May 22—The condition of the weather in many sections of the country has not yet consistently offered the proper background for business, and trade continues to labor under the handicap. However, business continues above last year's levels, and several indices suggest that the level of industrial activity during April was the highest for any month in more than five years.

FREIGHT CAR LOADINGS

Railway freight loadings for the week ended May 4 totaled 1,050,192 cars, which marks an increase of 72,135 cars over those in the corresponding week last year and an increase of 25,431 cars over those in the corresponding week two years ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended May 18 stood at 95.9, as compared with 95.7 the week before and 96.7 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended May 15 were 5 per cent below those in the similar week last year.

STOCK MARKET

The market was under severe pressure during the earlier part of the period; and, although there was a recovery at the end of the week, the majority of issues closed with net losses. Even so, numerous stocks showed gains for the week, while a few reached new highs for the year. Call money ranged from 7 to 15 per cent.

FEDERAL RESERVE BANKS

The consolidated statement of the Federal Reserve banks for the week ended May 15 showed decreases of \$47,000,000 in holdings of discounted bills and of \$11,000,000 in holdings of bills bought in the open market. There was an increase of \$7,000,000 in holdings of Government securities. The Reserve ratio on March 15 was 75.1 per cent, as against 74.3 per cent a week earlier.

Cliff Durant Retires

INDIANAPOLIS, May 23—Cliff Durant, 38, multi-millionaire sportsman, announced his permanent retirement from automobile racing today. Mr. Durant was booked to drive Tommy Milton's Detroit Special in the Memorial Day race here. He explained that he had more serious matters on his mind and that he no longer possessed the "reckless abandon" necessary to win an automobile race.

Survey by Department of Labor Shows Employment Continued High in April

WASHINGTON, May 23—The high level of employment maintained in March in the automobile and allied industries was continued during April, according to a report of a nation-wide survey of employment conditions made public by the Department of Labor.

A number of factories manufacturing rubber tires worked on a three-shift basis during the month, says the report. General employment throughout the country was described as "fairly satisfactory" in the report.

Employment in the principal automobile producing centers was reported as follows:

New York—General: Automobile plants maintained high level of production; New York City: Accessory, body-building and assembling plants employed additional help; Rochester: Automobile factories operated at high rate; Buffalo: Auto factories very busy; Syracuse: High production of automobiles maintained; Elmira: Automobile industry resumed full operations.

Pennsylvania—Automobile accessory plants operated at capacity; Phila-

delphia: Automobile plants employed additional help; Johnstown: Rubber tire industry employed full forces; Williamsport: Automobile motor plant reached new high level of employment.

Michigan—General: Automobile industry operated on satisfactory schedules; Detroit: Auto plants worked overtime; Flint: Surplus of labor in automotive industries; plants on satisfactory schedules, motor company building \$1,000,000 executive building.

Wisconsin—General: Automotive industries employed large numbers.

Ohio—General: Automobile industry reported excellent production and tire factories worked overtime; Cleveland: Shortage skilled mechanics; Akron: Rubber factories worked day and night shifts.

Missouri—General: Marked improvement in employment; St. Louis: Automobile assembling and rubber plants employed additional help; Kansas City: Automobile assembling plants increased forces.

Colorado—Tire plants increased operations.

American Eagle to Act on Joining New Group

NEW YORK, May 20—Porterfield Aviation Interests, Inc., has been organized in the State of Delaware to form a new center for the merging of aircraft manufacturing companies. The nucleus of this new group will be the American Eagle Aircraft Corp. of Kansas City, of which E. E. Porterfield, Jr., is president.

According to Mr. Porterfield the company also will take over shortly the controlling interest in the Lincoln Aircraft Co., Inc., and expects to line up a number of other manufacturers of planes, motors and accessories.

The organization of this new concern is part of a plan which will be submitted to stockholders of American Eagle on May 27, at which time a plan to increase capital stock to 2,000,000 shares as compared with the present 200,000 shares will also be presented. According to the plan stockholders of record June 1, will receive two shares of new stock in exchange for one of old and the rights to subscribe for one additional share for each share held at \$3.75 a share.

An option will be given Porterfield Aviation Interests on 400,000 shares of American Eagle at \$4 a share.

Metal Meetings Planned

BUFFALO, May 21—The Pressed Metal Institute is planning two meetings for next month. On June 7 the New England Group will meet at Bridgeport, Conn., and on June 14 the Western Group meets at Youngstown, Ohio. On account of the interest in the subject of predetermining the deep drawing qual-

ities of steel, it will have a prominent place on the program at both meetings, which are open to representatives of stamping plants. In order that the necessary arrangements can be made, those planning to attend either meeting are requested to advise Malcolm Baird, secretary, 232 Delaware Ave., Buffalo, N. Y.

Alabama Tire & Rubber to Start Building Soon

HUNTSVILLE, ALA., May 21—The Alabama Tire & Rubber Corp. has completed its organization here and expects to start construction of a \$1,000,000 automobile tire plant on its new site of several acres, early in June, according to J. E. Pierce, editor of the Huntsville Times, and president of the new company. The first unit of the plant will be ready to start production before the end of this year, and will have an initial capacity of 1000 tires and 1000 tubes per day, other units are to be added during 1930 until capacity has reached 5000 tires and tubes per day, it is said.

Atlanta Aircraft Plans First Unit of Factory

ATLANTA, May 22—Robert Gregg, who has been president for several years of the Atlantic Steel Corp., Atlanta, was elected president of the Atlanta Aircraft Corp. at a recent meeting of the board of directors, and plans are under way to start immediate construction of the initial unit of the new plant the company will establish at Candler Field here for the manufacture of all metal airplanes.

Capital of the company is \$300,000,

which has been fully subscribed. Monoplanes will be the company's product, each equipped with three Wright Whirlwind five-cylinder engines developing 165 hp. each, or three seven-cylinder engines developing 225 hp. each.

Detroit Section, S.A.E., Elects Hill Chairman

DETROIT, May 22—L. Clayton Hill of the Murray Corp. of America was elected chairman for the coming year of the Detroit Section of the Society of Automotive Engineers. Associated with Mr. Hill will be P. J. Kent, of the Chrysler Corp., as vice-chairman; Fred W. Marschner, of the New Departure Mfg. Co., as treasurer; L. K. Snell as secretary, G. B. Parsons, of the Parsons Mfg. Co., as vice-chairman in charge of the body division, and Robert Insley, of Continental Motors, as vice-chairman in charge of the aeronautic division.

Mr. Insley was appointed by the governing committee to succeed Wm. C. Naylor, who was fatally injured recently in an airplane crash. The speaker of the evening at the final meeting of the year was Joseph B. Graham, president Graham-Paige Motors Corp. who discussed the possibilities of the society in furthering cooperative efforts in the automotive industry.

Frank Burgess

BOSTON, May 21—Frank Burgess, head of the Boston Gear Works, died May 18 following a prolonged illness. Mr. Burgess was the founder of this firm, which manufactures stock gears, which it sells through branches and dealers throughout the country. He was a prominent member of the American Gear Manufacturers Association, and was widely known in the automotive and allied industries. He is survived by his wife, who lives at 355 Highland Ave., Wollaston, Mass.

Continental Opening Branch

DETROIT, May 21—Continental Motors Corp. is opening a branch office in Los Angeles to take care of the rapidly growing business west of the Mississippi. Ray Long, who has been associated with Continental Motors for many years as assistant sales manager of the industrial division, will take charge of the new office.

To Open Spark Plug Plant

ST. PETERSBURG, FLA., May 21—The Leonard Spark Plug Co., organized and incorporated at St. Petersburg recently, has acquired a building here and is installing machinery for the manufacture of spark plugs for automobiles, airplanes and boats. Initial capacity will be about 1000 spark plugs per day.

Auburn Exports High

AUBURN, IND., May 22—A new high mark for all time in export sales was set by Auburn for April. R. S. Wiley, export manager, has announced, with an increase of nearly 75 per cent over the same period last year.

Slight Decline in Steel Demand

Seasonal Easing of Automotive Orders Effects Prompter Deliveries

NEW YORK, May 23—While the downturn in automotive demand is beginning to make itself more or less felt in all descriptions of finished steel, the recession is so gradual that its orderly character comes in for much favorable comment. Its only effect, so far, is that in most lines deliveries are obtainable more promptly than heretofore. Makers of full-finished body stock still have sufficient of a backlog to compel them to be extremely conservative in promising early deliveries on new business.

Nor would it be possible to obtain deliveries on fresh orders for fender stock much before July, but hot-rolled strip steel ordered now would be shipped early in June unless specifications were out of the ordinary. If strip mills have to pay the \$2 per ton advance recently announced for third-quarter billets and slabs, they will try to pass the increased cost on to their customers, but there is still considerable doubt as to whether makers of semi-finished steel will be able to put across the higher third-quarter prices. Meanwhile non-integrated rollers are not placing any third-quarter commitments.

The talked of advance in full-finished body stock also hinges to some extent on the future course of the semi-finished market. In addition, however, much will depend upon how third-quarter automotive demand will shape up and when it will make itself felt. Several "independents" announced this week a new classification on blue annealed sheets, continuing the \$2.20, Pittsburgh, base price on No. 10 gage and governing net prices on Nos. 8 and 12 gages, and announcing a \$2.35 base price on No. 13 which governs net prices on Nos. 14, 15, and 16. Prevailing prices on black sheets are named in response to what inquiries for third quarter contracts have been received.

Pig Iron—A fair amount of interest in third quarter contracts is shown by Middle West automotive foundries. Old business suffices to keep shipments on a high level. Prices hold steady with the market's undertone firm.

Aluminum—Slightly less demand is noted for piston metal. Demand for remelted aluminum holds fairly steady. Imports run light. Prices are unchanged.

Copper—Announcement of affiliation of the largest "Independent" producer with the largest "Independent" rolling and fabricating interest gives to the industry a balance somewhat more along the lines of that which the steel industry has had for some time. Drastic curtailment of output is looked to as a remedy that will speedily restore buyers' confidence in prices. Quotations are unchanged, but there is less "outside" metal being offered at concessions.

Tin—It looks now as though the bull in-

Federal-Aid Roads Reported by Bureau

WASHINGTON, May 23—The total completed mileage of highway constructed under the Federal-Aid System on April 30, 1929, was 77,441, according to figures made public this week by the Bureau of Public Roads. There was under construction on April 30 a total of 8680 miles to cost approximately \$220,923,192, according to the Bureau's figures. On the same date there was approved for construction a total of 2297 miles to cost about \$49,954,592. At the close of April there was a balance of \$79,267,392 available in the Federal-Aid fund for new construction.

terest in London was gradually gaining the upper hand over the bears whose maneuvers have been largely responsible for the attractive prices which have prevailed of late. In tin, too, there is talk of concerted action with a view to cutting down production.

Lead—Consuming demand continues along moderate lines. The market rules steady.

Zinc—Efforts to bring about curtailment of ore production appear to entail considerable difficulty. The number of mines in operation has been cut down, but many of those which did not shut down are working overtime. The market is easy.

Aircraft Firm to Build

MIAMI, FLA., May 21—The Miami Aircraft Corp., organized and incorporated recently with \$500,000 capital by a group of prominent Miami business men, plans to start work within the next several weeks on the construction of a new plant at Miami for the manufacture of an amphibion type monoplane, it has been announced by Joseph S. Smoot, president of the company. The initial unit of the plant is expected to represent an investment of about \$250,000, including machinery and equipment.

Durant Signs With C. I. T.

DETROIT, May 22—The Durant Motor Co. has signed a long-term exclusive contract, by which the financing facilities of Commercial Investment Trust Corp., through its subsidiary companies, are available to Durant distributors and dealers throughout the country.

Take Over Anti-Knock Coatings

NEW YORK, May 21—The Petroleum Heat & Power Co., has taken over the exclusive rights under the United States patents on Katalite and Kalmite. It is the intention of the company, so far as the automobile industry is concerned, to concentrate its efforts on Kalmite. Dr. Edward Sokal, who invented the two preparations, is connected with the Petroleum Heat & Power Co., as a consulting engineer.

Helrick Appointed Hudson Secretary

Winnigham Made Director at Annual Meeting; Report Shows Progress

DETROIT, May 21—E. W. Helrick was appointed secretary and a director, and C. C. Winnigham was appointed a director of Hudson Motor Car Co. at the annual meeting of the company held here yesterday. Mr. Winningham is president of C. C. Winningham, Inc., advertising counsel, and has been associated with Hudson advertising for 20 years. He is also a director of the Union Commerce Investment Co., of Detroit.

The other officers of Hudson were re-elected, and the regular quarterly dividend of \$1.25 a share was declared payable July 1, to stockholders of record June 11. In his annual report, President William J. McAneney said:

"Since the introduction of our present Hudson and Essex models we have enjoyed a consistent and record-breaking demand. Shipments for the first three months of the year were 108,048 cars. This volume resulted in first quarter earnings of \$4,456,783 or \$2.86 a share—the most favorable first quarter showing we have ever made."

"In export activities our business continues in its strong position. The increase of business to date over last year is 28 per cent. For the first four months of this year we shipped 27,071 cars as against 21,214 a year ago. Counting both Canada and overseas operations, we may expect an export business for the year of from 70,000 to 75,000 Hudson and Essex cars."

Mr. McAneney predicted that the second quarter of Hudson business would exceed the first, reaching a production of 120,000 cars. In reviewing overseas distribution of Hudson and Essex cars he announced that all Europe, except England and Germany, would be served from a new Hudson-Essex assembly plant at Brussels, which will have a capacity of 15,000 cars a year.

Reo Using New Alloy

DETROIT, May 22—Announcement has been made by the Reo Motor Car Co. of the adoption of a new light alloy for pistons. This alloy, a product of the Aluminum Co. of America, is said to have a very low coefficient of heat expansion. The pistons are fitted at the skirt with a clearance of from 0.0045 to 0.0053.

The specific gravity of the new alloy is not much greater than that of the aluminum alloy usually used for pistons, and it possesses greater toughness so the pistons can be lightened to some extent. Owing to the toughness of the material, carbonyl cutting tools are used in the machining operations on the pistons.

M. & E. A. Members Set New High Mark

Sales by Manufacturers During April Show Index of 254

NEW YORK, May 23—For the third consecutive month, manufacturing members of the Motor and Equipment Association have established records in sales. The grand index of all sales, as compared with January, 1925, was 254 for April, compared with 241 in March and 196 in April of last year. Contributing groups establishing new records are: original equipment, with 287 for April as against 275 for March and 213 for April of last year; service parts, with 174 as compared with 148 in March and 151 in April of last year, and service equipment at 227 as compared with 224 in March and 164 in April, 1928.

Accessories have also shown improvement with an April index of 91, which compares with 85 in March and 107 in April of last year. Original equipment sales have proved a surprise to all factors of the industry as it was assumed that anticipated lowering of car production would be reflected in decreased demand for this equipment.

Service equipment is experiencing the greatest spring in the history of the industry and all factors are now looking for a record year in this branch. In fact, many interpreters believe that this will be a record year for the industry as a whole. Wholesale members of the association also showed a marked improvement during April with an index of 140 based on January, 1928, as 100 which compares with 121 for March, 105 in February and 107 in January of this year. This advance is registered in eleven of the twelve Federal Reserve districts and in Canada. Adverse weather is assumed to have contributed to slightly lowering the figure in the other Federal Reserve districts.

Louis H. Piper

NEW YORK, May 22—Louis H. Piper, Minneapolis banker and chairman of the board of Universal Aviation Corp. until that company was acquired by the Aviation Corp., died this week in Cleveland from complications arising from an attack of pneumonia. He was 42 years old and is survived by his wife and two brothers.

Aviation Company Formed

LOS ANGELES, May 23—The General Aviation Corp. has been formed by a group of Los Angeles business men to acquire control of aviation enterprises and to buy, trade and sell aviation securities. The corporation is authorized to issue 500,000 shares of no par common stock, of which 100,000 are to be offered at \$5 as the original working capital. The company will con-

fine its activities at first to the Pacific Coast and will first negotiate for the full purchase of an engine manufacturing company, an airplane manufacturing company, an airport and flying field, operating a transportation business. The directors and officers have not yet been named.

Canada Announces New Duty Rulings

WASHINGTON, May 23—A reclassification of wheels for motor trucks, for duty purposes, has been announced by the Canadian Commissioner of Customs, according to a report received this week by the Department of Commerce.

Under the rulings, which became effective April 10, 1929, disk wheels for motor trucks with a capacity up to two tons are of a class or kind made in Canada and are dutiable under tariff item 438c, at 30 per cent ad valorem, when imported from the United States, and not under tariff item 783, at 20 per cent.

Wire wheels for motor trucks, however, are considered to be of a class or kind not manufactured in Canada and are dutiable at 20 per cent ad valorem under item 783, when imported from the United States, according to the rulings.

Automobile Salon Plans Chicago Opening Nov. 9

NEW YORK, May 21—The 1929-1930 season of the Automobile Salon, which will mark its twenty-fifth anniversary in America, will open on Nov. 9, 1929, in the Drake, Chicago, and will continue to Nov. 16. It will be repeated at the Commodore, New York City, from Dec. 1 to 7 inclusive. The third staging will be in the Biltmore, Los Angeles, Feb. 8 to 15, 1930, and the final one in the Palace, San Francisco, Feb. 22 to March 1, 1930.

G.M. Truck Names Koehler

DETROIT, May 22—R. C. Koehler has been appointed assistant to the director of service of the General Motors Truck Co., according to O. M. Brede, director of service. For the past four years Mr. Koehler has been a member of the service division of General Motors Truck, and previous to that time was superintendent of service for the Chicago Nash Co.

A. W. Degen has been appointed technical service manager; F. W. Neikirk, parts service manager, and D. R. Veazey, chief service inspector, in the reorganized service department of the General Motors Truck Co.

De Palma Enters Race

INDIANAPOLIS, May 22—Ralph De Palma will drive one of the two Miller Specials owned by Alden Sampson, which have been entered in the International 500-mile race at the Indianapolis motor speedway, May 30. The car is new and has never been raced.

Republic-LaFrance Combine Completed

Products of New Companies Cover Entire Motor Truck Field

DETROIT, May 22—The consolidation of the Republic Motor Truck Co., Inc., and its wholly owned subsidiary, the Lynn Mfg. Corp. with the commercial truck division of the American-LaFrance and Foamite Corp., was completed a few days ago at a meeting held in the law office of Clark, Klein, Ferris, Cook & Williams, Detroit, and hereafter the new corporation will be known as the LaFrance Republic Corp. The sales subsidiary will be known as the LaFrance Republic Sales Corp. Preliminary details of this merger were announced in *Automotive Industries*, April 13.

The combined facilities of the new corporation make one of the strongest companies in the motor truck and tractor field. It has many branches throughout the country and a large number of distributors, both domestic and export. The line of heavy trucks manufactured by American-LaFrance and the lighter Republic vehicles gives the new company coverage over the entire motor truck field.

The balance sheet shows a ratio of current assets and liabilities of seven to one. The officers are: Joseph A. Bower, chairman of the board; Charles B. Rose, president; George R. Hanks, Franklin T. Pierce, Orley M. Canter and Thomas M. House, vice-presidents; Glenn S. Crisp, secretary, and Ralph W. Stark, treasurer.

Tractor Group Grows

CHICAGO, May 22—Three new units have joined the \$125,000,000 United Tractor & Equipment Corp., the recently organized cooperative farm implement company, Milton W. Anderson, president, announced yesterday. The new members are the Main Steel Products Co., Portland, Me., maker of snow plows; the T. S. Rowell Co., Waukesha, Wis., manufacturer of feed mills, ensilage cutters and silo fillers, and the Northwestern Co., Milwaukee, maker of portable electric arc welding equipment.

Handley-Paige Issues

NEW YORK, May 22—Handley-Paige, Ltd., is floating in the American market a limited issue of 10 per cent participating preference shares to be sold at about \$6.50 a share.

Cooper Corp. Names Hennecke

CINCINNATI, May 21—Earle V. Hennecke, former vice-president and general manager of the Moto Meter Co., has been made vice-president of the Cooper Corp. of Findlay and Cincinnati, in charge of battery and tire advertising and sales promotion.

Willys Announces Two Light Trucks

Model C-101 a Six, While
96-A Has Four-Cylinder
Engine

TOLEDO, OHIO, May 20—Two light trucks utilizing powerplants of the same dimensions as the Overland passenger cars have been announced by Willys-Overland, Inc. One of these, known as the Whippet Six truck or as the Model C-101, has a rating of a maximum allowable gross weight of 7000 lb. but is also referred to as a 1½-ton truck. The powerplant comprises a six-cylinder engine of 3½ by 3¾ in. bore and stroke. It has a rating of 50 hp. at 3000 r.p.m.

An alloy steel frame is used, with 6 by 2½ by 5/32 in. section. Chrome-vanadium steel half-elliptic springs are fitted, 36 by 1¼ in. in front and 45 by 2½ in. in the rear. The rear axle is a semi-floating type with reduction by spiral bevel gears at a standard ratio of 5.44 to 1. The tread is 56 9/16 in. at the front and 59 in. at the rear. Malleable iron wheels are fitted and carry 30 by 5 in. pneumatic tires. A spare rim, mounted on a carrier under the rear part of the frame, is included in the equipment. Engine equipment includes a Tillotson carburetor, battery ignition, cellular radiator with centrifugal pump, thermostat and belt-driven fan, an 11-gal. fuel tank and a vacuum tank.

The truck is provided with four-wheel mechanical brakes, Bendix three-shoe internal brakes being fitted in front and Overland external brakes in the rear. The chassis weight is 2540 lb. Equipment regularly furnished with this truck includes a speedometer, jack, complete set of tools, pressure grease gun, hand tire pump, air cleaner and gasoline filter.

The other model is known as the Model 96-A and is a light, fast delivery wagon chassis. It has a four-cylinder engine of 3½-in. bore by 4¾-in. stroke, which has a rating of 40 hp. at 3200 r.p.m. This chassis has an alloy steel frame with a 4½ by 1½ by 9/64 in. channel section, chrome-vanadium steel springs, 35 ¼ by 1½ and 49 ½ by 1½ in., a semi-floating pressed steel type of rear axle with a standard reduction ratio of 4.55 to 1, four-wheel brakes of the same type as the other model, and artillery-type wheels with 28 by 4.75-in. balloon tires on Hayes rims.

S.A.E. Talks Aviation

NEW YORK, May 24—W. E. Boeing, chairman of the board, United Aircraft & Transport Corp.; J. T. Tripp, president, Pan American Airways, Inc.; Lester D. Seymour, general manager, National Air Transport Co., Inc.; and Capt. Emory S. Land, of the Guggenheim Foundation and the National Advisory Committee for Aeronautics, were



Left to right are: H. J. Klinger, vice-president and general sales manager; James M. Crawford, chief engineer; Charles F. Barth, vice-president and general manager of manufacturing, and Marvin E. Coyle, vice-president and general auditor. Their promotions to these positions by the Chevrolet Motor Co. were announced in Automotive Industries last week

among the speakers on the program for the "experience meeting" of the Metropolitan Section, S.A.E., which was held at the Park Central Hotel last night. The general subject of the meeting was announced as "Experiences in Aviation Transport During the Past Year," and the meeting was the last one of the spring season.

Firestone Gives Talk on Master Service Station

BOSTON, May 22—Harvey S. Firestone, president of the Firestone Tire & Rubber Co., in addressing the Boston Chamber of Commerce here yesterday, described the typical future master service station for each town as one which all motorists will have on their lists. This will be centrally located and will offer every form of service and all accessories, he said. Mr. Firestone explained that he devoted considerable time on his recent trip through the South and West in studying the possibilities of such stations.

He recounted an incident in his company's history, when, during the depression of 1921, he received a cablegram to return from a vacation in Europe. At this time, Mr. Firestone said, the company faced payments of \$42,000,000 and sales had dropped. By spending \$100,000 a week for advertising, Mr. Firestone said the company sold \$18,000,000 of tires and was able to make banking arrangements to tide the company over.

Traffic Expert Visiting

NEW YORK, May 22—N. Fugioka, head of the traffic division of the Metropolitan Police Board of Tokio, Japan, is now in New York studying at first hand how America handles motor traffic in her largest cities. Mr. Fugioka presided at a meeting in Tokio last year at which Walton Schmidt, field representative of the National Automobile Chamber of Commerce, spoke, using motion pictures to illustrate American methods of traffic control and accident prevention.

Gain of 5.78 Per Cent Shown by Car Producers

DETROIT, May 21—A gain of 5.78 per cent in net profits was enjoyed by 15 motor car manufacturers during the first quarter of 1929, as compared with the corresponding period of 1928. The comparative earnings of the companies follow:

	1929	1928
Chrysler Corp.	\$8,538,173	\$4,702,466*
Franklin (H. H.) Co.	388,000	48,600
General Motors	61,910,987	69,468,576
Graham-Paige	523,641	257,783
Hudson	4,567,783	4,207,373
Hupp Motor Corp.	1,501,595	1,615,528
Mack Trucks	1,429,587	745,672
Nash Motors	4,118,870	2,604,378‡
Packard	7,087,303	4,607,267‡
Peerless	23,833	193,624†
Pierce-Arrow	448,531	359,763†
Reo Motor	537,514	86,489†
Studebaker	4,865,057	3,979,873
Willys-Overland	2,028,020	1,647,576
Yellow Truck	58,852	537,608†
Totals	\$98,067,746	\$92,707,608

Increase 5.78 per cent.

Note: Where figures published are before certain charges they have been so indicated here.

* Excluding Dodge Brothers.

† Quarter ended Feb. 28.

† Deficit.

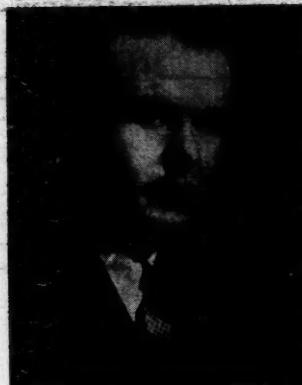
Willys Making Inspection

TOLEDO, May 21—John N. Willys, president of the Willys-Overland Company and chairman of the Foreign Trade Committee of the National Automobile Chamber of Commerce, who sailed for Europe May 15, will make a two weeks' inspection tour of the company's factories in Manchester, England, and Berlin, Germany. The primary objective of the trip is to confer with the company's European executives on plans for handling the increased Willys-Overland overseas business.

Colin Campbell, vice-president of the company in charge of sales is now making a tour of the West, visiting dealers, and did not accompany Mr. Willys to Europe as certain reports indicated.

Men of the Industry and What They Are Doing

Appointed to New Sales Positions by Auburn



As announced last week in Automotive Industries, N. E. McDarby (left) has been appointed to the newly-created position of director of sales of the Auburn Automobile Co. H. L. Brinck (right) has been named sales manager for the Auburn division of the company



Marmon Names New Posts in Factory Organization

J. A. Bohannon, vice-president of the Marmon Motor Car Co., Indianapolis, has announced the creation of several new factory positions with consequent adjustments of personnel. E. C. Sudhoff, for the last year head of the purchasing department, has been named supervisor of materials, a new position created to coordinate purchasing and production schedules. C. M. McAlpin has been appointed purchasing agent.

R. S. Wiegand will continue in charge of material control, a position to which he was appointed recently. The handling of material has been placed in charge of John Skove, formerly with the Truscon Steel Co., Cleveland. C. A. Dutton has been named to fill the newly created position of master mechanic, in charge of plant maintenance and the tool division. Ernest McGeorge, of Cleveland, has been retained by the company in an advisory capacity as building and maintenance engineer.

Firestone to Referee Race

Harvey S. Firestone, president of the Firestone Tire & Rubber Co., has been named referee for the International 500-mile race to be run at the Indianapolis Motor Speedway, May 30. Mr. Firestone is known to have been an ardent student of automobile racing for many years because of its importance to the development of tires. Among those who have refereed the Indianapolis speed classic in the past are Henry Ford, Charles M. Schwab and Lawrence P. Fisher.

Lundborg Visits Nash

Capt. Einar Lundborg, Royal Swedish Air Force, who thrilled the world with his daring rescue of General Nobile and the survivors of the ill-fated dirigible "Italia" from death on Arctic ice floes last May, slipped quietly into Kenosha for a visit to The Nash Motors Co., recently, chatted with officials of

the company, and slipped away, leaving new friends in the wake of his friendly smile.

Autocar Promotes Borton

C. A. Borton, manager of the Boston factory branch of the Autocar Co., Ardmore, Pa., has been appointed assistant to the president of the company and will be assigned to the factory for duty, it was announced this week. Mr. Borton has been with the Autocar organization since 1906.

Edward F. Coogan, manager of the New Haven factory branch, will succeed Mr. Borton in Boston, and J. E. Higgins has been transferred from the Providence branch to succeed Mr. Coogan at New Haven.

Crawford to Sail June 1

Charles Crawford, of the General Motors Export Co., has been appointed chief engineer of Adam Opel, A. G., Russelsheim, Germany. He plans to sail with his family June 1 on the steamship Deutschland to assume his new duties.

Major Gardner Sails

Major Lester D. Gardner, member of the Council of Aeronautical Chamber of Commerce, who holds the European record for traveling by air, sailed for Europe recently to investigate new foreign developments in aviation.

Stewart to Head Mill

Robert Stewart will be superintendent of the Goodyear Clearwater Cotton Mills No. 2 now under construction at Rockmart, Ga., according to an announcement by the Goodyear Tire & Rubber Co. He has been assistant manager of Goodyear Devon Mills at New Bedford, Mass.

Clare Touring West

W. A. Clare, vice-president of the Houde Engineering Corp., manufacturer of Houdaille shock absorbers, Buffalo, N. Y., is taking a month's business trip through the West, visiting Houdaille distributors.

Hudson Appoints Rue

The Hudson Motor Car Co. has announced the appointment of H. Dale Rue as manager of its used car department. Mr. Rue has been in the automobile industry nearly 20 years, with his time divided about equally between activities as a distributor or dealer and as a factory sales executive. He has been two years in the Hudson-Essex organization.

Indiana S.A.E. Elects Dingley

Bert Dingley, vice-president of the Stutz Motor Car Co. of America, was unanimously elected chairman of the Indiana Section of the S.A.E. at the meeting May 18. Charles A. Trask, equipment efficiency engineer with Rockwood Mfg. Co., was elected treasurer, and Harlow Hyde, sales promotion consultant, was elected secretary.

Marshall Leaves Naval Plant

Lieut.-Commr. Edward L. Marshall, Civil Engineer Corps, U. S. N., plant superintendent of the Naval Aircraft Factory at the Navy Yard, Philadelphia, has been called to Washington for other duty. Commr. Marshall's present assignment dated from November, 1927. His successor at the Naval Aircraft Factory has not been announced.

Francis With Ford 16 Years

William A. Francis, recently appointed eastern manager of Ford Motor Co., with headquarters at Kearney, N. J., started in with that company in 1913 at the Long Island City plant. In 1922 he was appointed branch manager in Cincinnati, being transferred from there to the branch managership in Boston toward the close of 1925.

Chevrolet Promotes Gerker

Bernard H. Gerker has been promoted to resident engineer of the Flint plant of Chevrolet Motor Co., succeeding Leroy V. Cram, who has been named assistant chief engineer of Chevrolet with offices in Detroit. Mr. Gerker has been assistant to Mr. Cram for the past 17 months.

Clendenin Joins Ward Motor

John C. Clendenin, formerly associated with the automotive engineering department of the General Electric Co., has accepted a position as sales engineer with the Ward Motor Vehicle Co., Mount Vernon, N. Y.

Bopari Visits N.A.C.C.

Among recent visitors at the National Automobile Chamber of Commerce was Bachint Singh Bopari, who has spent the past seven and one-half years in this country studying the automotive industry at four or five of the leading plants in the country.

Dutch Ford Unit Arouses Interest

Flotation in Holland to Dispose of 20,000 of 50,000 Shares

WASHINGTON, May 23—Dutch automotive circles have indicated a keen interest in the formation of N. V. Mederlandsche Ford Automobiel Fabriek (Netherlands Ford Automobile Co., Ltd.), at Rotterdam. The company was formed by notarial deed on April 10 and its proposed statutes are now being revised by the Ministry of Justice, prior to publication by Royal Decree, says a report received this week by the Department of Commerce.

Capital stock of the Ford company has been set at 5,000,000 guilders (2,000,000), divided into 50,000 shares of 100 guilders par value each.

Five thousand shares have been paid for in cash by the Ford Motor Co., Ltd., of England, and 25,000 shares have been turned over to the English company in exchange for all rights and profits connected with patents, inventions, etc., present and future, obtained from the Ford company at Detroit and Henry Ford personally, so far as they concern Netherlands. The remaining 20,000 shares of common stock have been obtained by it from the founders for flotation in Holland at 100 per cent fully participating in profits from Nov. 1, 1928.

Bus Line Merger Completed

CHICAGO, May 20—Completion of a merger of three key motor transport companies, controlling stage lines in nearly every state and representing a capitalization of \$30,000,000, has been announced here. The merger brings together, through an exchange of stock, the Greyhound Lines, operated by the Motor Transit Corp., with headquarters in Chicago; the Yelloway System, with offices on the Pacific Coast, and the Pickwick Stages, with general offices at Los Angeles. The bus lines operated as a subsidiary of the Southern Pacific Railway will be a party to the union.

Curtiss-Caproni to Build

NEW YORK, May 21—The Curtiss-Caproni Corp., recently organized by Curtiss interests for the manufacture in this country of Caproni planes, will erect a plant in Baltimore for the production of large transport planes at a cost of approximately \$1,000,000. This plant will be ready for production in the fall.

Ford, Ltd., Earns \$3,000,000

DETROIT, May 22—Bongard and Company, of Toronto, have made public a report showing that the Ford Motor Co. of Canada, Ltd., earned approximately \$3,000,000 during the first quarter of 1929. On the basis of the first quarter the report estimates that earnings for the current year will reach

\$12,000,000, or equivalent to more than \$6.50 a share on the 1,800,000 shares outstanding. The best previous year was 1925 when earnings for the 12 months were shown to be slightly above \$6,000,000.

G.M. Sales to Dealers

Show 15 Per Cent Gain

NEW YORK, May 18—During the month of April General Motors dealers delivered to consumers 223,303 cars, according to an announcement by Alfred P. Sloan, Jr., president. This compares with 209,367 for the corresponding month last year, an increase of 13,936 cars or 6.7 per cent for April this year. Sales by General Motors manufacturing divisions to dealers amounted to 227,718 cars, as compared with 197,597 for the year previous, an increase this year of 30,121 cars, or 15.2 per cent.

The following tabulation shows monthly sales of General Motors cars by dealers to ultimate consumers and sales by the manufacturing divisions of General Motors to their dealers:

	Dealers Sales to Users		1927
	1929	1928	1927
Jan.	104,488	107,278	81,010
Feb.	138,570	132,029	102,025
Mar.	205,118	183,706	146,275
Apr.	223,303	209,367	180,106

	Divisions Sales to Dealers		1927
	1929	1928	1927
Jan.	127,580	125,181	99,367
Feb.	175,148	169,232	124,426
Mar.	220,391	197,821	161,910
Apr.	227,718	197,597	169,067

Marmon Sets Record

INDIANAPOLIS, May 20—The Marmon Motor Car Co. established a new shipment record last week, when 1657 Marmon Models 68 and 78 and Roosevelt cars were sent from the factory in the six days ended May 18, G. M. Williams, president, announced today. This total shows the average daily shipments for the week as 276 cars as compared with a schedule of 250 cars a day established shortly after the Roosevelt was announced to the public less than two months ago.

Velie Sale Makes \$50,000

MOLINE, ILL., May 21—More than \$50,000 was realized recently from sale of part of the machinery at the Velie Motors Corp. plant, it has been announced by Lester L. Winternitz, of Winternitz & Co., Chicago, in charge of the sale. The sale was conducted for John Normoyle, Moline machinery dealer, who had purchased the equipment from the Velie estate. Scores of firms were represented and many valuable machines were disposed of.

Plane Orders Total \$5,730,000

CLEVELAND, May 18—The Great Lakes Aircraft Corp., of Cleveland, has received new orders for airplanes totaling \$730,000, it is announced by Charles F. Van Sicklen, vice-president in charge of sales of the corporation. This makes a total of \$5,730,000 worth of orders closed since the All-American Aircraft Show in Detroit last month.

Financial Notes

Aviation Corp. has obtained final control of Universal Aviation Corp. and Embry-Riddle Co., mid-western airway operators. The plan for this acquisition was announced some time ago but was somewhat delayed by the slow deposit of Universal stock to be exchanged for Aviation Corp. stock. Enough of this stock, however, has now been deposited so that Aviation Corp. has secured control of the other two companies.

Although the time set for the final deposit of Universal stock for exchange of Aviation Corporation stock expired May 20, at which time 63 per cent of the stock was deposited, requests have been received for extension of time to make this deposit. In order that stockholders of Universal may profit to the fullest extent by the exchange, the books will be kept open until the close of business May 31.

E. I. du Pont de Nemours & Co. has declared an extra dividend of 50 cents a share in addition to regular quarterly dividends of \$1 each on common stock and \$1.50 on six per cent debenture stock. This company thus passes on to its stockholders the extra 30 cents dividend recently declared by General Motors together with other profits from other operations.

Pierce-Arrow Motor Car Co. and subsidiaries report net profit for the four months ended April 30 after all charges of \$379,679. This is equivalent after dividend requirements on six per cent preferred stock to \$3.65 a share on no par Class A. All Class B stock is owned by the Studebaker Corp. Net profit for April was \$431,147.

Kelsey-Hayes Wheel Corp. has declared its quarterly dividend of 50 cents, payable June 20 to stock of record June 1. This dividend applies to 749,444 shares, the total stock to be outstanding after subscription rights are exercised to 107,065 additional common shares.

Packard Electric Co. reports net earnings for April of \$64,129, an increase of \$21,460 over April, 1928. Net income for the first four months of the current year was \$217,108 as compared with \$148,052 for the corresponding period last year.

Fiat, Italian automobile manufacturer, reports net profits after all charges of \$8,320,557. Dividends amounting to \$2,628,812, or 12½ per cent on 2,000,000 shares of 200 lire par value each.

C. M. Hall Lamp Co. has declared an extra dividend of 12½ cents in addition to its regular quarterly dividend of 37½ cents, both payable June 15 to stock of record June 1.

Chicago Yellow Cab Co. has declared regular monthly dividends of 25 cents each, payable July 1, Aug. 1, and Sept. 2, respectively, to stockholders of record June 20.

Omnibus Corp. has declared a quarterly preferred dividend of two per cent, payable July 1 to holders of record June 14.

Vesta Battery Co. has declared quarterly preferred dividend of 1½ per cent, payable June 1 to stockholders of record May 21.

Willys-Overland Co. has declared regular quarterly dividend of \$1.75, payable July 1 to stockholders of interest June 15.

Gardner Talks Plan With Sears-Roebuck

Begin Investigation of Mail Order Market for Light Cars

CHICAGO, May 22—Negotiations leading to possible merchandising of automobiles through mail order and chain store houses have been opened between Sears, Roebuck & Co. and the Gardner Motor Co., Inc., of St. Louis, it has been learned authoritatively here.

The negotiations thus far are confined to a cooperative effort on the part of the research departments of both companies to determine whether such merchandising policies are practical and if so what type of automobile would be best suited to this market. It was understood from sources close to Robert E. Wood, president of Sears, Roebuck & Co., that the investigations on the part of the research department of the company is the only phase of the negotiations that has been entered into as yet.

ST. LOUIS, May 21—Russell E. Gardner, Jr., president of the Gardner Motor Co., Inc., in announcing that his company had entered into an agreement with Sears, Roebuck & Co., for an investigation of the possibilities of producing a low-priced automobile for mail order distribution, said:

"We feel that it is a compliment to be selected by Sears, Roebuck & Co. and we expect to succeed in developing a light car for them. Such a vehicle would not compete with the regular Gardner eight-in-line, which will continue to be produced and sold through dealers."

PHILADELPHIA, May 22—In the absence of William Rosenwald, regional vice-president of Sears, Roebuck & Co., it was said here today that no statement regarding the agreement between the Gardner Motor Car Co. of St. Louis, and Sears-Roebuck could be given out.

Between 1905 and 1910 Sears, Roebuck and Co. manufactured a gasoline automobile for mail order sale. The car was known as the "Sears" and was essentially a buggy with a gasoline engine mounted on the frame. Since discontinuing the sale of the car the company has not entered the gasoline automobile field. The present report of an agreement with the Gardner Motor Car Co. brings up the possibility of a reentry. The Sears-Roebuck company is already a large retailer in the automobile tire and accessory fields, in some cities maintaining stores primarily for the sale of automobile accessories.

Crude Rubber Active

NEW YORK, May 20—Crude rubber trading was rather active last week, with prices showing an advancing tendency, according to F. R. Henderson

Corp., which attributes this fact to high consumption figures for April coupled with increased speculative interests. The Henderson company quotes the Rubber Manufacturers Association as giving arrivals of crude rubber at all ports of the United States for April as 54,171 tons. The company estimates arrivals between May 1 and 17 to be 25,000 tons, with arrivals for the month at the probable figure of 48,000 tons.

Olds Awards Contract for Sheet Metal Plant

DETROIT, May 21—Olds Motor Works has let a contract for the construction of a new sheet metal plant at Lansing. The building will be 500 by 180 ft. and will be completed in September. When the new building is finished, Oldsmobile-Viking will have completed the addition of 1,000,000 sq. ft. of floor space during the past two years.

The present sheet metal machinery will be moved to the new factory as soon as it is completed and the present sheet metal plant will be used for the expansion of the sheet metal finishing and plating departments. Olds is rushing work on its new administration building.

Richard E. Bissell

CLEVELAND, May 20—Richard Elwood Bissell, chief engineer of Thompson Products, Inc., maker of automotive parts, died May 15, at the age of 37 years, a victim of the Cleveland Clinic explosion.

Mr. Bissell was born at Milford, Mich. He attended Michigan State College, graduating with a degree of Bachelor of Science in 1913. The following year he received a Master of Science degree from the University of Michigan. In 1927 an honorary degree in Metallurgical Engineering was conferred upon him by Michigan State College in recognition of contributions he had made to automotive progress.

He went with Thompson Products, Inc., 10 years ago as head of the metallurgical department and was made chief engineer last October. Mr. Bissell also directed the activities of a subsidiary company, Thompson Research, Inc., devoted to experimental work with automobile and airplane parts.

Raymond H. Van Nest

BUFFALO, May 21—Raymond H. Van Nest, aged 46 years, vice-president and secretary of the USL Battery Corp., Niagara Falls, N. Y., died recently in Baltimore from a complication of diseases. Burial took place in Washington, D. C. Mr. Van Nest had been affiliated with the USL Battery Corp. for 15 years.

Goddard & Goddard Building

DETROIT, May 18—Goddard & Goddard Co., Inc., milling cutter engineers and manufacturers, have broken ground for a new factory and office building, of modern construction on the company's eight-acre site here. The floor area will total 47,000 sq. ft.

Government Reports on Engine Progress

Work at Philadelphia Believed to Have Wide Significance

WASHINGTON, May 23—Results of work now being done at the Aeronautical Engine Laboratory, Naval Aircraft Factory, Philadelphia, Pa., "may profoundly affect the decision of internal combustion motors" and are "important not only to aviation but to the automotive industry in general," the Navy Department announced this week.

"The new type of engine will be made more compact and rugged than the old water-cooled type, it will consume less gasoline, and is adapted for use in all types of internal combustion engine service," the Department announced.

The work was begun by the Navy Department more than five years ago in connection with a study of various anti-freeze solutions. The results achieved are summarized in a report entitled "Report on Investigation of High Temperature Cooling System," recently printed by the Government.

Oil companies have offered to cooperate with the Navy in developing a special type of oil which will prevent scoring of the cylinders and frozen pistons in the new engine, it was declared.

Hupp Export Shipments Show 53 Per Cent Gain

DETROIT, May 20—Export shipments of the Hupp Motor Car Corp. for the fiscal year ending April 30, exceeded the best previous similar period by 53 per cent, according to an announcement by the company. The best previous fiscal year was that ending April 30, 1928, when 2917 cars were shipped to dealers abroad. This compares with 4467 New Century Sixes and Eights shipped from Aug. 1, 1928, to April 30 of this year, or a gain of 1550 cars.

"Hupmobile's export picture is growing by leaps and bounds," according to the company's statement. "The actual number of cars has not only increased among our older overseas distributors, but we are constantly adding representative firms in all of the larger countries. Metropolitan centers also have shown an exceptional increase in the sale of Hupmobile cars."

Hungary Fixes Duty

WASHINGTON, May 23—Automobiles with closed or open body and containing a rear seat, are regarded as "six-seaters" and are required to pay the corresponding import duty, if the horizontal distance from the front edge of the rear seat to the front dashboard is more than two meters, under a decision just promulgated by the Hungarian Minister of Finance and reported this week to the Department of Commerce.

**Plans for Gardner Annual Trophy Race,
to Be Held May 28 and 30, Announced**



The Trophy and Its Two Donors

Fred W. Gardner (left), executive vice-president, The Gardner Motor Co., Inc., and Russell E. Gardner, Jr. (right), president of the company, are shown with the silver cup which has been added to the \$10,000 in cash prizes for the Gardner Annual Trophy Race

ST. LOUIS, May 22—Detailed plans for the Gardner Annual Trophy Race for commercial airplanes, to be held in St. Louis on May 28 and 30, have been announced by Russell E. Gardner, Jr., president of the Gardner Motor Co., Inc. Parks Airport, the site of Parks Aircraft, Inc., in the St. Louis metropolitan district, is to be the scene of the event, which is actively sponsored by the Air Board of the St. Louis Chamber of Commerce. Russell E. Gardner, Jr., and Fred W. Gardner, have given cash prizes of \$10,000 in addition to donating the silver cup.

The race is to be divided into two phases, the first being a five-fold elimination contest from which the contestants will be selected for the second phase. There is only one restriction for contenders: that no competing engine shall be of more than 800 cu. in. displacement. The first phase of the con-

test consists of five separate races from the following starting or control points: Buffalo, N. Y.; Jacksonville, Fla.; San Antonio, Texas; Denver, Colo., and Fargo, N. D. Contestants may choose to race from any of these points. The start will be made at 5 a.m. St. Louis time, May 28. Each of the five preliminaries carries a first prize of \$750 and a second prize of \$250.

A total of ten planes, winners of first and second places, in the preliminaries, will enter the second phase on Memorial Day. They will take off from St. Louis, race to Indianapolis, turn a pylon there over the Speedway during the Memorial Day automobile race and swing back to Parks Airport.

The flyer making the round trip in the fastest time will win the \$5,000 placed for the final race. The event has the official sanction of the National Aeronautic Association.

Canadian Output Gains

WASHINGTON, May 23—Canadian automobile production set a new monthly record in March, 1929, with 40,261 units, an increase of 20 per cent over the previous record made in May, 1928, and 30 per cent more than in February, 1929, according to a report made public this week by the Department of Commerce. Canadian passenger cars and

trucks exported in March reached a value of \$6,634,049, an increase of 44.6 per cent over February, 1929, and 244 per cent over March, 1928, exports, the figures show.

Monarch Moves Assembly

ROCKFORD, ILL., May 22—Monarch Aircraft Industries, Chicago, has removed its assembly department to the Riverside garage building in this city.

**April Production
Totaled 662,557**

**Government Figures Show
Third All-Time Record
This Year**

WASHINGTON, May 21—The total April production of passenger cars and trucks in the United States and Canada was 662,557, according to figures compiled by the Department of Commerce from reports of 151 manufacturers in this country and from the Dominion Bureau of Statistics.

The April output establishes a new all-time production record, for the third consecutive month this year, exceeding the previous all-time monthly record established in March by 37,029 units and surpassing the record of August 1928, by 170,014 units. It compares with a production of 434,315 cars and trucks for April, 1928.

Production for the first four months of 1929 was 2,208,251 units, compared with 1,441,589, in the corresponding period last year, a difference of 767,662 units.

The following table is based on the Department of Commerce report and shows revised figures for January, February and March of this year:

	1928		
	Cars	Trucks	Total
Jan.	212,351	27,840	240,191
Feb.	301,466	34,834	336,300
Mar.	387,048	43,735	430,783
Apr.	385,394	48,921	434,315
Total ...	1,286,250	155,330	1,441,589
May	405,627	54,098	459,725
June	381,963	43,232	425,195
July	358,914	58,398	417,312
Aug.	424,867	67,576	492,543
Sept.	375,463	61,044	436,507
Oct.	353,162	62,658	415,820
Nov.	*225,608	*43,301	*268,909
Dec.	*212,727	*30,814	*243,541
Total ...	4,024,590	576,551	4,601,141
1929			
Jan.	*306,610	55,921	*422,531
Feb.	*435,400	64,235	*497,635
Mar.	548,007	*77,521	*625,528
Apr.	573,071	88,486	662,557
Total ...	1,921,088	297,163	2,208,251

* Revised.

Explains Salvador Market

WASHINGTON, May 23—Salvador has become an important market for American automobiles, Consul General S. L. Wilkinson, El Salvador, has pointed out in a report received this week by the Department of Commerce. The American automobile has a virtual monopoly, the report states. Of a total of 1535 passenger cars registered on Jan. 1, 1929, 96 per cent were American; of the 110 buses, 236 trucks and 114 motorcycles, the American percentage is 100, 98 and 83, respectively, the report adds.

MacClatchie Grooms New L-Head Engine

COMPTON, CAL., May 21—Final grooming of the "Panther," L-head radial aviation engine, for its Department of Commerce test has been begun in the Compton plant of the MacClatchie Mfg. Co. The new 150 hp. engine will leave about June 1 for Washington, according to J. Warren MacClatchie, head of the company.

Complete specifications, power curve and installation drawing of the "Panther" have just been compiled under the supervision of T. C. Alexander, chief engineer for MacClatchie. Outstanding characteristics of the seven-cylinder engine include an outside diameter of only 35 in.; the absence of rocker arms and all allied parts, and a simple lubrication system. These are in line with MacClatchie's effort to cut down wind resistance, increase power and provide for easier servicing and inspection.

In addition to the testing crews a staff of mechanics is at work in the first section of MacClatchie's \$200,000 plant just completed, machining and assembling the new engines. Mr. Alexander is already making first plans for a five-cylinder L-head radial.

Agreement Aids Car Exports

WASHINGTON, May 23—The new commercial agreement between France and Czechoslovakia, providing for reciprocal most-favored-nation treatment and special tariff concessions, signed on July 17, 1928, became effective on April 24, 1929, it was announced by the Department of Commerce this week. The new agreement replaces the previous agreement of Aug. 17, 1923. Automobiles, motorcycles and trucks are included among the items shipped from France which take reduced duties under the agreement. Automotive ve-

Problem in Toronto Seen in Used Cars

WASHINGTON, May 23—According to a report received this week by the Department of Commerce there are 32,000 used cars on the Toronto, Ont., market and dealers are considering the curtailment of trade-in transactions and instalment buying.

hicles from Czechoslovakia, formerly subject to the French minimum tariff rates only under limited contingents, are now allowed the benefits of the minimum rates without limitation as to quantity.

Safety Contest Planned

NEW YORK, May 20—A nationwide essay contest on the subject, "Safety on the Highway for Children and Adults," is to be conducted by the National Grange. All members under 18 years of age in any grange throughout the United States will be eligible to enter the contest. Prizes are being donated by the National Automobile Chamber of Commerce and the Highway Education Board is cooperating in the enterprise. The competition will close July 4.

Bugatti Sets Race Record

PARIS, May 15—Albert Divo, driving a 122 cu. in. supercharged Bugatti, won the twentieth annual Targa Florio race on the island of Sicily, for the second time, at an average speed of 46.2 m.p.h. He covered the distance of 320 miles in 7 hr. 15 min. 41 sec., or 5 min. 4 sec. faster than any car has ever been driven over the five laps of this mountain circuit.

Secretary Lamont Sees Huge Exports

WASHINGTON, May 23—American exports may reach six billions of dollars during this year, it was predicted here this week by Robert P. Lamont, Secretary of Commerce.

"The total value of exports, including re-exports of foreign merchandise, for the four months ending April was \$1,846,658,000. This was an increase of nearly one-fifth (17.9 per cent) over the same period of 1928, and the largest total reported for the first four months of any year since 1921, at which time prices were very much higher and when there was still a large carryover of orders from the immediate post-war boom.

"Exports during the first four months of the year are normally much smaller than during the last four months, when crops are being heavily moved. If the same rate of increase over 1928, as was shown from January to April, should continue throughout the year, exports would amount to at least six billions."

Paris to Have 100 Buses

WASHINGTON, May 23—A hundred motor buses designed to carry 42 instead of 36 passengers will be put into service in Paris shortly, the Department of Commerce was informed in a report received from Assistant Trade Commissioner Schuette. The buses are to be of a new type having six-cylinder engines, four speeds and equipped with pneumatic tires. They will be of French construction.

Tax Data Prepared

NEW YORK, May 20—A series of folders describing the collection and distribution of gasoline taxes has been prepared by the American Petroleum Institute for distribution among drivers.

Calendar of Coming Events

SHOWS

International Aircraft Exhibition, Olympia, London	July 16-17
International Aircraft Exhibit, Coliseum, Chicago	Sept. 7-15
National Machine Tool Builders' Exposition and Congress, Cleveland	Sept. 30-Oct. 4
Paris, Automobiles	Oct. 3-13
London, Automobiles	Oct. 17-26
Prague, Automobiles	Oct. 23-30
Paris, Motorcycles	Oct. 23-Nov. 3
M.A.E. Show and Convention, Chicago	Nov. 4-9
N.S.P.A. Show and Convention, Detroit	Nov. 11-16
Berlin Auto Salon	Nov. 14
London, Trucks	Nov. 7-16
Paris, Trucks	Nov. 14-24
London, Motorcycles	Nov. 30-Dec. 7
Brussels Auto Salon	Dec. 7
New York National	Jan. 4-11
Chicago National, Coliseum	Jan. 25-Feb. 1

CONVENTIONS

A.S.M.E. Aeronautic Meeting, St. Louis	May 27-30
Automotive Engine Rebuilders' Association, Detroit	May 27-29
National Automobile Chamber of Commerce Annual Meeting, New York City	June 6

Joint Meeting, Oil and Gas Power Division of the American Society of Mechanical Engineers and Pennsylvania State College, State College, Pa. June 24-27

American Society Testing Materials, Annual Meeting, Atlantic City, June 24-28

Motor Bus Division, A.A.A., Third Annual Meeting, Buffalo. July 1-2

American Automobile Association, Buffalo. July 1-2

National Association of Show and Association Managers, Meeting, Chicago. July 25-26

American Welding Society, Fall Meeting and Exposition, Cleveland. Sept. 9-12

American Institute of Mining and Metallurgical Engineers, Cleveland, Sept. 9-12

American Society for Steel Treating, Convention and Exposition, Cleveland. Sept. 9-13

A.S.M.E.—Iron and Steel Division—National Meeting, Cleveland. Sept. 11-13

Society for Electrical Development, New York City. Sept. 12

Eastern States Exposition, Springfield, Mass. Sept. 15-21

American Electric Railway Association, Atlantic City. Sept. 28-Oct. 4

National Safety Congress, Annual, Chicago. Sept. 30-Oct. 4

Society of Industrial Engineers, Detroit. Oct. 16-18

World Engineering Congress, Tokio, Japan. Oct. 29-Nov. 22

RACES

Gardner Trophy (Aircraft), St. Louis, May 28-30

Indianapolis May 30

Detroit June 9

Altoona, Pa. June 15

Rudge Whitworth Cup, Le Mans, June 16-17

Salem, N. H. June 29

French Grand Prix June 30

Spanish Grand Prix July 31

British Tourist Trophy Race Aug. 17

Akron Aug. 18

National Air Races and Show, Cleveland, Aug. 24-Sept. 2

European Grand Prix, Italy. Sept. 8

Syracuse Aug. 31

Altoona, Pa. Sept. 2

Cleveland Sept. 15

Salem, N. H. Oct. 12

S. A. E.

Summer Meeting, Saranac Lake. June 25-28

Aeronautic Meeting, Cleveland. Aug. 26-28

Production Meeting, Cleveland. Oct. 2-4

Annual Meeting, Detroit. Jan. 21-24